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A TEXT-BOOK

ON THE

PRACTICE OF GYNECOLOGY

FOR PRACTITIONERS AND STUDENTS

BY

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WITH TEN HUNDRED AND FORTY-SIX
NEW LINE DRAWINGS ILLUSTRATING THE TEXT

BY

JOHN V. ALTENEDER

Second Edition

PHILADELPHIA AND LONDON
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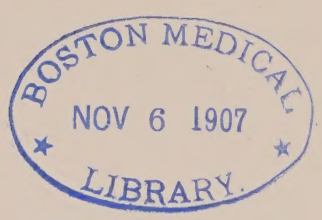

PRESS OF
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PHILADELPHIA

THIS BOOK IS DEDICATED

TO MY WIFE

ALICE ASHTON

AS A TOKEN OF LOVE AND IN APPRECIATION OF HER
CONSTANT AND LOYAL COMPANIONSHIP DURING
THE YEARS THAT HAVE GONE BY

PREFACE TO THE SECOND EDITION.

The generous reception given to this work by the profession and the medical press has made it necessary to prepare a second edition in the brief period of six months after publication. This very flattering result demonstrates that the general practitioner and the medical student appreciate a treatise on gynecology which assumes that the reader is not an expert gynecologist and therefore describes in detail not only what *should be done* in every case but also precisely *how to do it.*

In making this revision of my practice of Gynecology within so short a time the changes are necessarily few in number and chiefly limited to correcting a few typographic errors and altering several of the illustrations.

William Easterly Ashton.

2011 Walnut Street,
January, 1906.

PREFACE.

There is, I believe, a place for a Practice of Gynecology which aims to take nothing for granted in describing gynecologic diseases, and which not only states what should be done in every case, but also gives directions and illustrations so explicit that they may be intelligently and easily followed. Although I may be taken to task by some of my critics for leaving nothing to the imagination or common sense of my readers, yet I believe the mass of the profession who have had neither the time nor the opportunity to devote themselves to specialism will gladly acknowledge their limitations and appreciate a treatise on any subject in medicine or surgery which enters fully into details and endeavors to meet the requirements of practical men.

I have considered fully both the medical and surgical aspects of gynecology, and have discussed each subject so far as possible upon the basis of my own experience. If a multiplicity of methods or operations is given for the treatment of a disease, the results must be unsatisfactory, as such a description is at best incomplete or fragmentary in character and leaves the reader with an imperfect conception of the subject. I have therefore in each instance given that which in my judgment is the best plan of treatment, and afterward described such variations as may be required in the management of atypical cases. In following this plan it has been necessary to exclude certain operations and methods of treatment employed by other surgeons, and I do not wish to be misunderstood as implying that they have no value, as I have been guided solely by the desire to present a treatise which shall give a thoroughly detailed account of the practice of gynecology from the standpoint of the general practitioner and the student of medicine.

The book is unusually large for a work on gynecology, but it was impossible to lessen the number of pages and at the same time give the necessary technic details and space for the large number of illustrations.

The illustrations, which number ten hundred and forty-six cuts, are all new line drawings which were made under my personal supervision from actual apparatus, living models, dissections on the cadaver, and the operative technics of other authors. I have endeavored so far as possible to show each step of the various methods of diagnosis and treatment, as well as the different operations, by a separate drawing in order to clarify the text and enable the student to see at a glance the details of the several procedures. All the instruments, needles, and suture materials used in every important operation are shown by a separate drawing, which is placed before the operative technic, so that the surgeon may readily select what is required and be sure that nothing has been omitted. The same plan has been followed in illustrating the instruments used in making the various gynecologic examinations, as it was thought to be an advantage for the examiner to see at a glance precisely what was needed in a given case. The drawings which illustrate the pathologic conditions met in gynecologic practice are purely diagrammatic in character and made to represent typical lesions. Half-tones from photographs of actual specimens were not used for illustrations, as it was found impossible to reproduce details with any degree of clearness, and

the particular conditions which they were supposed to represent were so often obscured by coexisting lesions that they were practically worthless.

The opening chapters, on Microscopic and Bacteriologic Examinations, the Blood in Relation to Surgery, the X-rays in Gynecology, Hydrotherapy, Constipation, Diet, Indoor Exercises, and Saline Injections, have been written with the object of giving definite information which can be used at the bedside and at the same time serve as a working basis for the purely gynecologic subjects which follow.

The chapter on Microscopic and Bacteriologic Examinations gives the practitioner precise instructions how to obtain and preserve morbid secretions and tissues and deliver them in proper condition to the pathologist. The practitioner is thus placed in close touch with the laboratory and can take advantage of scientific methods of diagnosis. No mention is made of the technic by which the pathologist examines the specimens, as this subject should be studied in special treatises and not discussed superficially in a work devoted to practice.

The arrangement of the book on an anatomic basis permits a discussion of the methods of examining each organ before describing its diseases and renders unnecessary the usual chapter on physical examinations, which, on account of its broad generalization, tends to confuse the student. This plan enables the practitioner to study different methods of examination step by step, and to familiarize himself with the subject in a practical manner.

I am under special indebtedness to my assistant, Dr. John A. McGlinn, for his faithful and zealous work in assisting me in the revision of the manuscript and valuable suggestions too numerous to mention. I also wish to thank my assistants, Drs. Charles B. Reynolds and George E. Johnson, for their assistance in the preparation of the index.

I am indebted to Miss Margaret P. Pridham, formerly Directress of the Training School for Nurses at the Medico-Chirurgical Hospital, and to the "Handbook of Invalid Cooking," by Mary A. Boland, for much assistance in the preparation of the chapter on Diet.

My thanks are due to Messrs. Charles Lentz & Sons, of Philadelphia, for the loan of instruments and apparatus which were used in drawing many of the illustrations.

I take this opportunity to express my appreciation of the pioneer work of Prof. Howard A. Kelly in the field of ureteral and vesical diseases, and to acknowledge my indebtedness to him for original investigations which have resulted in a more intelligent understanding of these affections.

All the illustrations have been drawn by Mr. John V. Alteneder, head of the Art Department of Messrs. W. B. Saunders and Company, and I am especially glad to express my appreciation not only of his splendid work, but also his many practical suggestions. His technic skill and untiring interest are shown in the character of the drawings, which are remarkable for their anatomic accuracy and clearness of detail.

Finally, I wish to thank the publishers, Messrs. W. B. Saunders and Company, for their cordial and unselfish co-operation in assisting me to complete my laborious task.

William Easterly Ashton.

2011 Walnut Street.

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PRACTICE OF GYNECOLOGY.

CHAPTER I.

GENERAL TECHNIC OF GYNECOLOGIC EXAMINATIONS.

Office Examining Table.—A properly constructed examining table is essential for the physician's office, and it should be so arranged as to enable the examiner to place the patient in the different gynecologic postures. The Ashton table is built with adjustable supports for the patient's feet to rest on, and with a movable extension board at the back to lengthen the table when the patient is placed in the horizontal recumbent posture.

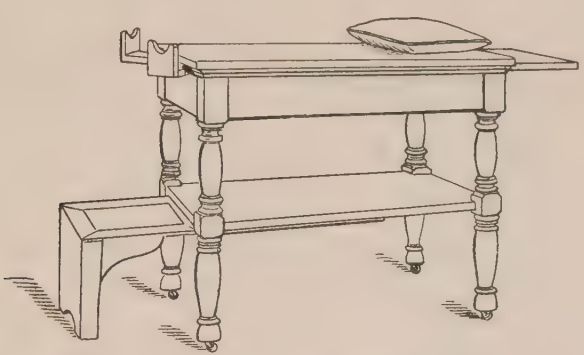

FIG. 1.—ASHTON'S OFFICE EXAMINING TABLE.
Showing the adjustable supports for the patient's feet and the movable extension board and step.

Hospital Examining Table.—Boldt's operating table is made of metal and covered with white enamel. It has a movable glass top, which can be elevated or lowered as required, and adjustable leg-holders and stirrups. The table is neatly constructed and is especially well adapted for gynecologic examinations and operations (Fig. 2).

Examination at the Patient's Home.—It is important when an examination is made at a private house that the patient should be placed in a correct position, otherwise the results are unsatisfactory and mistakes are very likely to be made in the diagnosis. By using adjustable leg-holders and stirrups there should be no difficulty whatever in making a satisfactory examination and ascertaining the condition of the pelvic organs without employing a specially constructed table (Fig. 3).

The canvas or leather leg-holders that are commonly sold in the shops, and which are passed over the shoulder of the patient to support the legs and thighs, are utterly useless for an examination at a private house, as they do not steady the body and therefore it is difficult to palpate the pelvis properly.

The patient may be examined in the following ways: (1) Lying lengthwise on a bed; (2) lying crosswise on a bed; and (3) lying on a kitchen table.

Lying Lengthwise on a Bed.—This is an unsatisfactory position in which to make an examination, and should never be employed, except to palpate or inspect the abdomen, unless the patient is too ill to place crosswise on the bed or to examine on a table. Vaginal or rectal touch and bimanual palpation are practically the only methods of examination that can be employed with a patient in this position, as it is impossible to use a speculum or any other instrument for diagnostic purposes under the circumstances.

The patient and the bed are arranged as follows: Lift the hips of the patient a few inches above the bed and slip the leaf of a dining-table or a small ironing-board under the sheet. This gives a firm support to the patient's hips and prevents them from sinking into the mattress. The head is then supported on a pillow, the knees drawn up and widely separated, and the feet placed near the buttocks. The examiner now kneels on one knee at the side of the bed, passes his hand under the upper sheet and over the leg of the patient, and introduces the index-finger into the vagina or the rectum. The free hand is then passed over the patient's thigh and placed on the abdomen above the pubes and counter-pressure made downward in the direction of the internal finger.

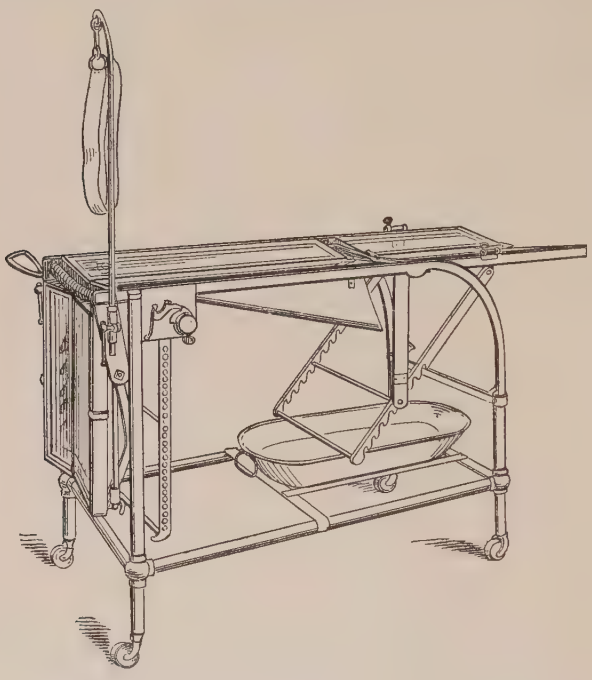

FIG. 2.—BOLDT'S HOSPITAL EXAMINING AND OPERATING TABLE (page 17).
Showing an adjustable stirrup with strap and a heel stirrup.

Lying Crosswise on a Bed.—This is a very satisfactory position in which to make an examination, as the patient is under thorough control and there is no difficulty whatever in using the speculum as well as other instruments for diagnostic purposes.

The patient and the bed are arranged as follows: Place the leaf of a dining-

table or a small ironing-board lengthwise on the mattress and close to the side board of the bed under the sheet. Next attach Lentz's modified Edebohls's leg-holders to the side-board of the bed and then place the patient crosswise

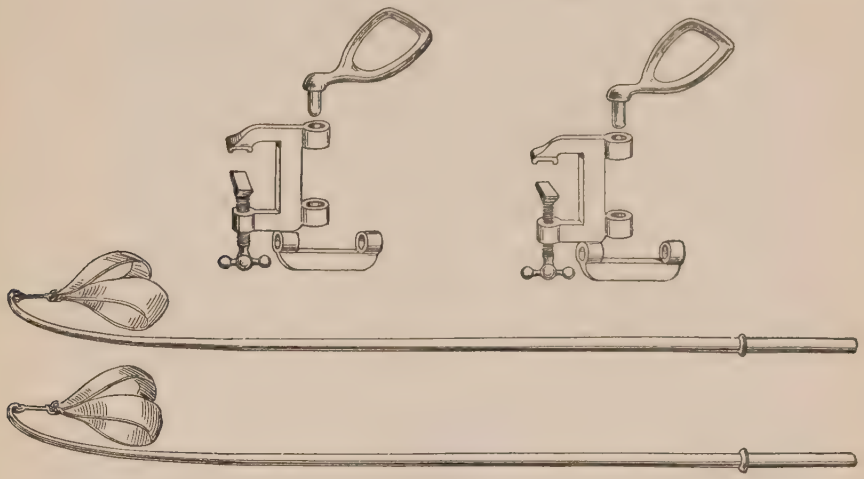

FIG. 3.—LENTZ'S MODIFICATION OF EDEBOHLS'S ADJUSTABLE LEG-HOLDERS (page 17).
The apparatus is made of nickel-plated steel and can be adjusted by the clamps to an ordinary table or the side-board of a bed.

with her buttocks close to the edge and her heels resting in the stirrups. The examiner now kneels on one knee in front of the vulva and makes the necessary examinations (Fig. 5).

FIG. 4.—POSTURE OF A PATIENT LYING LENGTHWISE ON A BED.
The position of the ironing-board under the sheet is indicated by dotted lines.

If the physician does not have the adjustable leg-holders, fairly good substitutes can be improvised by placing two chairs eighteen inches apart at the side of the bed for the patient to rest her feet on (Fig. 6).

Lying on a Kitchen Table.—This is by far the best substitute for a spe-

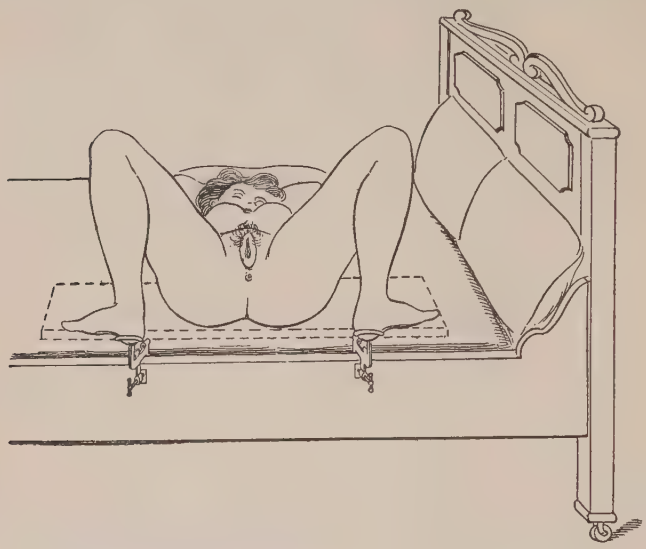

FIG. 5.—POSTURE OF A PATIENT LYING CROSSWISE ON A BED WITH THE HEELS SUPPORTED BY ADJUSTABLE STIRRUPS (page 18).
The dotted lines indicate the position of the ironing-board under the sheet.

cially constructed examining table, and as a matter of fact with the leg-holders attached the latter offers no marked advantages. A kitchen table can be ob-

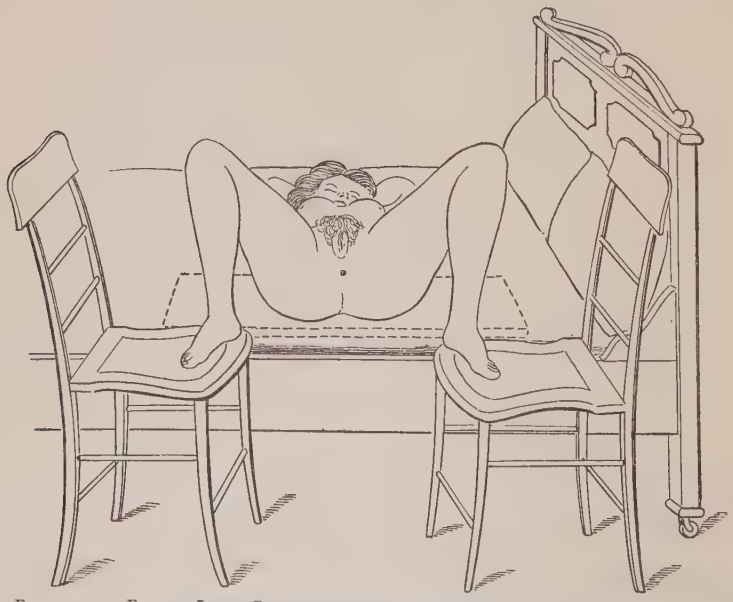

FIG. 6.—POSTURE OF A PATIENT LYING CROSSWISE ON A BED WITH THE FEET RESTING ON CHAIRS (page 19).
The position of the ironing-board is shown by dotted lines.

tained in every household, and the physician should always insist, at least for the first examination, upon having it brought to the patient's room.

The patient and the table are arranged as follows: Cover the top of the table with a blanket and a sheet and attach the leg-holders. The patient is then placed in the dorsal position with her feet fastened in the stirrups and her head resting on a pillow.

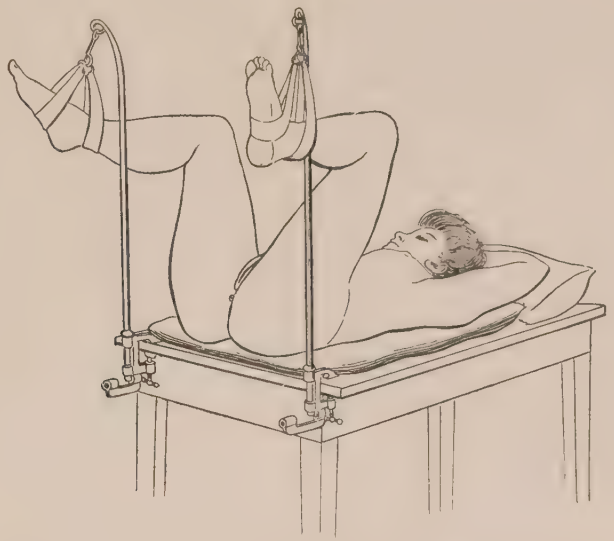

FIG. 7.—POSTURE OF A PATIENT LYING ON A KITCHEN TABLE.
The feet are supported by adjustable leg-holders attached to the top of the table.

Examination of Girls and Unmarried Women.—An anesthetic should always be employed in the examination of girls and unmarried women, as the necessary manipulations are naturally a shock to their sense of modesty, and they are usually in such a nervous and excitable state under the circumstances that it is practically impossible to obtain sufficient relaxation of the muscles to palpate the organs satisfactorily.

Unless there are good reasons to the contrary, vaginal touch should not be employed, especially if the hymen is intact; but when the indications demand an examination by that route, the physician should not allow any false ideas upon the subject to interfere with what is best for the patient's interest. In the majority of cases, however, a thorough and complete examination can be made by rectal or recto-abdominal palpation, and consequently one or both of these methods should always be employed before resorting to vaginal touch, which can be used subsequently if required.

Anesthesia.—The importance of the routine use of an anesthetic in gynecologic examinations is frequently overlooked, and consequently many avoidable mistakes are made in the diagnosis of pelvic affections. Ether, chloroform, or nitrous oxid gas should therefore be employed, as a rule, in investigating pelvic diseases, as it is often impossible without an anesthetic to overcome the resistance of the muscles or the sensitiveness of the parts.

I therefore strongly recommend the use of an anesthetic whenever the examiner has the slightest doubt of the condition of the pelvic organs. Under these circumstances he should refuse to express an opinion until the examination has been properly made, as it is impossible even for an expert to ascertain the nature of an intrapelvic lesion without an anesthetic in women who are fat or nervous or where the pelvis is tender and sensitive.

Nitrous oxid gas is a very convenient anesthetic for brief examinations and may be administered at the private office of the surgeon, the hospital, or the patient's house. The gas should be given combined with oxygen by means of an apparatus devised by the S. S. White Dental Company of Philadelphia, which is portable and easily managed. The apparatus consists of a metal frame, two cylinders of gas and one of oxygen and the necessary mixing valves, and the inhaler. The anesthetic is administered as follows: The nitrous oxid gas is administered alone until cyanosis and respiratory disturbances appear, and then a sufficient quantity of oxygen is mixed with the gas to give a healthy appearance to the patient's face. During the examination the mixture of the gases should be carefully regulated in order to obtain complete muscular relaxation, and at the same time prevent respiratory disturbances. When the examination is finished, the nitrous oxid gas is shut off and pure oxygen administered for several moments. The patient returns to full consciousness in two or three minutes and has no disagreeable after-symptoms.

Preparation for the Administration of Chloroform or Ether.—A purgative dose of citrate of magnesia should be given the night before, followed in the morning by an enema of soapsuds and water. The bladder should be emptied spontaneously just before the anesthetic is given. The examination, if possible, should be made in the morning, about two or three hours after a breakfast of toast and a cup of tea or coffee.

Antisepsis.—Gynecologic examinations must be conducted with due attention to the principles of antisepsis, and the examiner must not only guard against becoming infected himself, but he must also prevent infection being carried to his patient. The strictest precautions and the most careful watchfulness are therefore required or accidents are bound to occur, and health or life may be the price paid for carelessness. The danger of infection is always present. The patient may inoculate the examiner with syphilis or infect a slight cut or scratch on his finger which may result in general sepsis. The examiner, on the other hand, may carry the infection of gonorrhea or syphilis from one patient to another on the instruments or his hands, or, again, he may infect the uterine cavity, the urethra, the bladder, or the ureters with a dirty instrument.

Preparation of the Examiner's Hands.—The finger-nails should be kept short and evenly filed (for method see p. 814) and the hands free from roughness or abrasions. The unprotected hands should never be used to make an internal examination if there is the slightest scratch upon them.

The hands are cleansed by thoroughly scrubbing them with liquid soap and warm water before and after making an examination. The brushes should be made of vegetable fiber (see p. 828) and sterilized each time they are used. They are very cheap and can be repeatedly sterilized. A good plan in private practice is to set aside the dirty brushes until after office hours, when they can be rinsed in clear water and boiled for five minutes in the office sterilizer containing a 1 per cent. solution of carbonate of soda. The brushes are then taken out of the solution and wrapped in a clean towel until ready for use again. In hospital practice the brushes are sterilized with high-pressure steam in a specially constructed apparatus (see p. 814).

I strongly recommend the use of rubber gloves to protect the hands in making gynecologic examinations, because they are, after all, the only certain means we possess of preventing infection. The risk that the examiner runs in making daily examinations of a large number of women cannot be overestimated, and he should therefore spare no expense or trouble in guarding himself against infection. The gloves should never be used twice without resterilization, and it is therefore necessary to have several pairs. After making an examination the gloves are washed in warm water and liquid soap and rinsed in plain water; they are then removed from the hands and laid aside for subsequent sterilization, which is accomplished by boiling them in a solution of soda (1 per cent.) for five minutes and finally wrapping them in a clean towel.

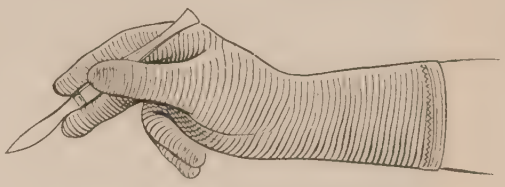

Fig. 8.—Rubber Glove.

The use of finger-cots should be condemned, as they only partially protect the hands and are therefore worse than useless.

Preparation of the Instruments.—The antiseptic precautions must be thorough and no instrument should be used a second time without being resterilized. The common habit of simply washing a speculum with soap and water and then using it again on the next patient is absolutely wrong, as it is not surgical cleanliness; and while it lessens the danger of infection, it is not by any means a positive prevention. Practically there is only one way to guard against accidents, and that is never to use an instrument a second time without thoroughly cleaning it with liquid soap and water and then boiling it in a solution of carbonate of soda (1 per cent.) for five minutes. This will of course necessitate having a double set of speculums and other instruments, but there should be no hesitancy on that account when we consider the great danger of spreading infection.

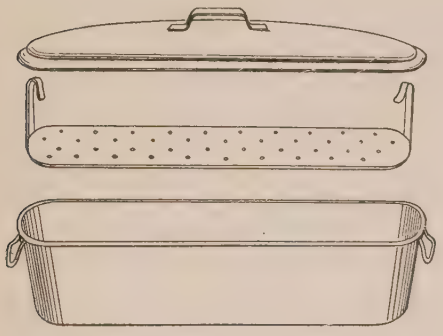

Fig. 9.—White Enameled Steel Office Sterilizer with Handles and a Perforated Tray.

The physician should have in his office a small white enameled sterilizer with handles and a perforated tray, a stand for the sterilizer, and an alcohol lamp, or if gas is used the stand should be made with a tubular Bunsen burner attached (Figs. 10, 11, and 12).

One set of instruments can then be placed in the sterilizer while the other set is being used, and in this way perfect asepsis can be carried out with but very little trouble.

Preparation of the Patient.—The rectum should be thoroughly emptied with an enema of soapsuds and water and the bladder evacuated spontaneously just before the examination. The bladder should never be evacuated with a catheter if it can be avoided, because the organ can be more thoroughly

emptied spontaneously than by catheterization, and hence we should not unnecessarily expose the patient to the danger of septic infection. The corsets should be removed and all clothing that constricts the waist should be loosened. In some cases it is necessary to empty the lower bowel and clean out the intestines before the examination. To accomplish this, nothing is better than giving the patient a purgative dose of citrate of magnesia the night before, followed by an enema of soapsuds and water the next morning.

When special instrumental examinations are made, the sterilization of the vagina, the vulva, and the surrounding parts must be thoroughly carried out; but when touch and direct inspection are alone employed, no antiseptic prepa-

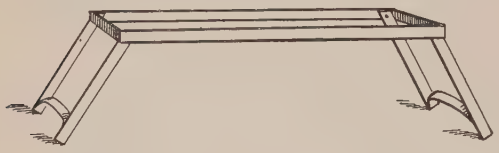

FIG. 10.—STERILIZER STAND (page 23).

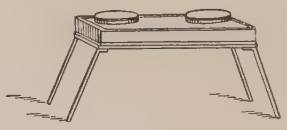

FIG. 11.—ALCOHOL LAMP (page 23).

ration whatever is indicated, as any form of douching or scrubbing will remove the discharges and thus obliterate in some cases the evidences of disease.

The vulva and the external urinary meatus are sterilized by scrubbing with a gauze sponge saturated with liquid soap and warm water and then douching the parts with a solution of corrosive sublimate (1 to 1000), which in turn is removed by sterile water.

The vagina cannot be thoroughly sterilized unless the patient is under the influence of an anesthetic, as the necessary mechanic scrubbing of the parts is quite severe and painful. (For Technic see p. 831.) Sterilization of the vagina, however, is seldom required in making a gynecologic examination, as it is indicated only when the uterine sound is used or the uterine cavity is cureted

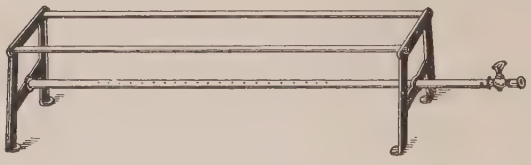

FIG. 12.—STERILIZER STAND WITH A TUBULAR BUNSEN BURNER ATTACHED (page 23).

for diagnostic purposes or a piece of the cervix is excised for microscopic investigation.

Lubricant.—A liquid soap contained in a bottle with a sprinkler top is the best lubricant to use for the hands and instruments. Vaselin or other oily substances are difficult to keep sterile and hard to remove, and consequently they are liable to harbor germs around the finger-nails or in the joints of the instruments.

After cleaning the hands as described above and putting on a pair of sterile gloves, the examiner sprinkles several drops of liquid soap into the palm of the examining hand and lubricates the fingers with the thumb of the same hand. After completing the digital examination he again sprinkles some soap on the palm of his hand and lubricates the blades of the speculum by dipping them into it.

As described elsewhere, liquid white vaselin which has been previously sterilized by boiling should be used to lubricate instruments which are used to examine the urethra, the bladder, or the ureters. This substance is unirri-

Fig. 13.

Fig. 14.

Fig. 13.—Sprinkler Top Bottle Containing Liquid Soap. Fig. 14.—Method of Sprinkling Liquid Soap into the Palm of the Hand.

tating and does not coat the mucous membrane or change the appearance of the parts.

Glycerin is the best lubricant to use for the fingers in making an examination in cases of cancer of the cervix, as it is easily removed and no odor remains on the hands.

The Cleansing and Lubricating Soap.—A liquid soap contained in a bottle with a sprinkler top should always be employed for cleansing and lubricating purposes except, as stated above, when liquid white vaselin is used as a lubricant on certain instruments. The advantages of a soap of this kind contained in a bottle are self-evident. It never becomes contaminated, as a cake of hard soap does that is used constantly to cleanse the hands between examinations, because it is sprinkled from the bottle and there can be no contact with what remains unused.

A good liquid soap can be prepared as follows: Chop eight ounces of soap into small pieces and put them into an agate kettle containing two quarts of filtered water. Place the kettle on a stove and as soon as the water boils and the soap is thoroughly dissolved pour the mixture into a clean half-gallon bottle with a ground-glass stopper. The liquid can then be poured directly into a small bottle with a sprinkler top and used when required.

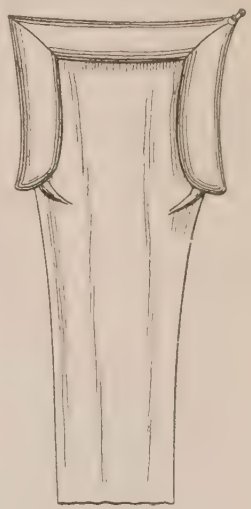

Fig. 15.—Kelly's Surgical Pad (page 26).

I am in the habit of using the ordinary tincture of green soap (*linimentum saponis mollis, U. S. P.*) as a lubricant and for cleansing the hands, and consider it a thoroughly reliable preparation.

The method of sterilizing liquid soap contained in small sprinkler top bottles is described on page 814.

Irrigating Pad.—Whenever it is necessary to sterilize the vulva or vagina before an examination, an irrigating pad should be placed under the patient's hips and the water allowed to flow into a bucket placed on the floor.

The Kelly pad is the best appliance for this purpose and should always be used in preference to a metal douche pan (Fig. 15).

A piece of rubber sheeting and a bath towel may be used as a substitute for the Kelly pad. The towel is folded into a roll and placed in a half-circle at the end of the top of the table. The rubber sheeting is then thrown over the towel and its free end dropped into a bucket on the floor.

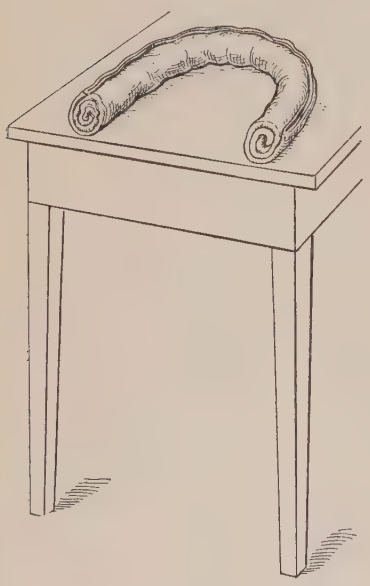

Fig. 16.

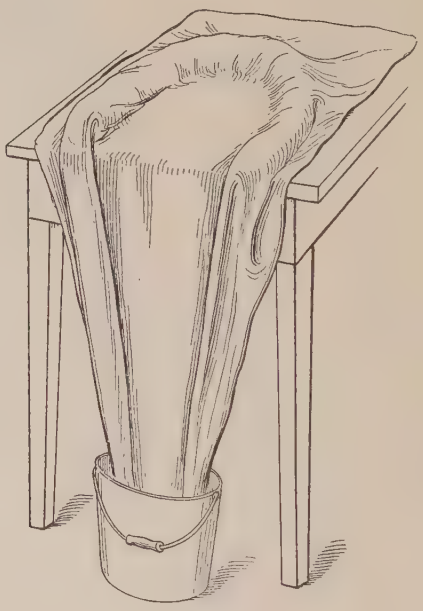

Fig. 17.

Ashton's Substitute for the Kelly Pad.
Showing the method of folding the bath towel (Fig. 16) and the position of the rubber sheeting (Fig. 17).

The Examining Hands.—**Internal Hand.**—Usually only the index-finger is used for palpation, as two fingers are apt to cause pain unless the vagina is very capacious. When the patient is under an anesthetic, however, the examination should be made with two fingers, as more information can be obtained at times with two than with one.

The fingers of the hand are held in two ways: *First*, the index-finger and the thumb are extended and the other fingers placed in the palm of the hand; if two fingers are used, the index and middle fingers are extended.

Second, all the fingers are extended with the thumb resting on the mons veneris, the index and middle fingers inserted into the vagina or the rectum, and the ring and little fingers lying in the gluteal cleft.

The tips of the fingers can always be carried higher up in the pelvis by making strong pressure upward on the perineum with the knuckles of the examining hand (Fig. 20).

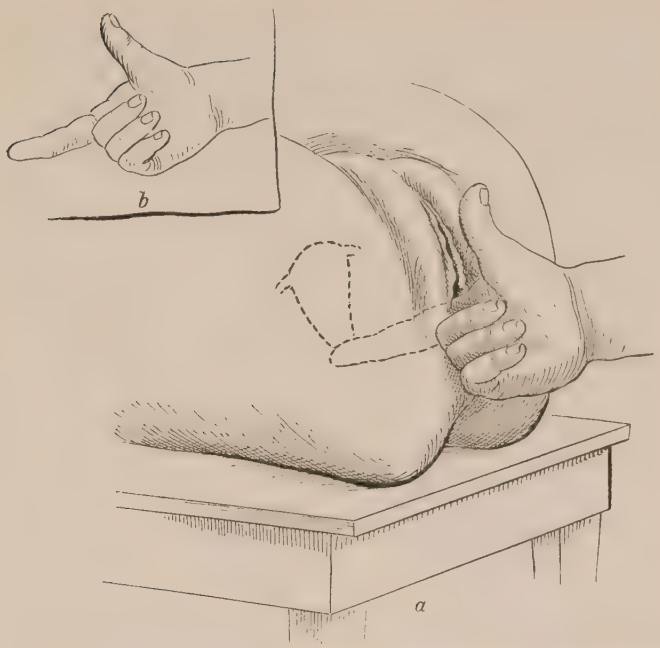

FIG. 18.—POSE OF THE FINGERS IN MAKING AN INTERNAL EXAMINATION BY THE FIRST METHOD (*a* and *b*).

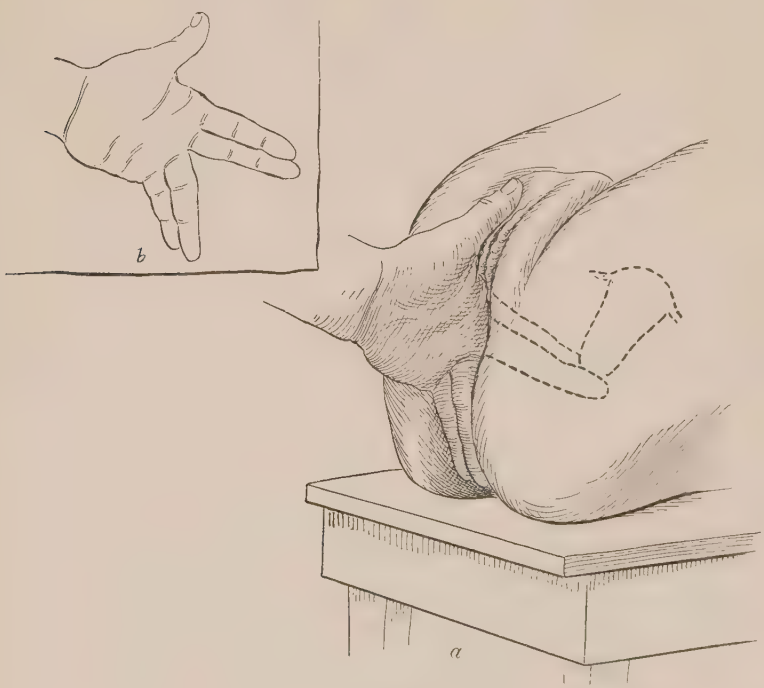

FIG. 19.—POSE OF THE FINGERS IN MAKING AN INTERNAL EXAMINATION BY THE SECOND METHOD (*a* and *b*).

External Hand.—The fingers are used for palpation and the thumb to steady the hand. When the pelvic organs are palpated through the abdominal wall, the fingers should not be held straight and rigid, but slightly flexed, so that the parts can be easily and gently manipulated.

Assistants.—Every physician who is doing much gynecologic work should have a female office assistant to arrange the patient on the examining table and look after the instruments, etc. She should be neat in her appearance, cheerful in disposition, and thoroughly instructed in her work. It is not necessary to have a graduated nurse, as any capable and willing woman can be

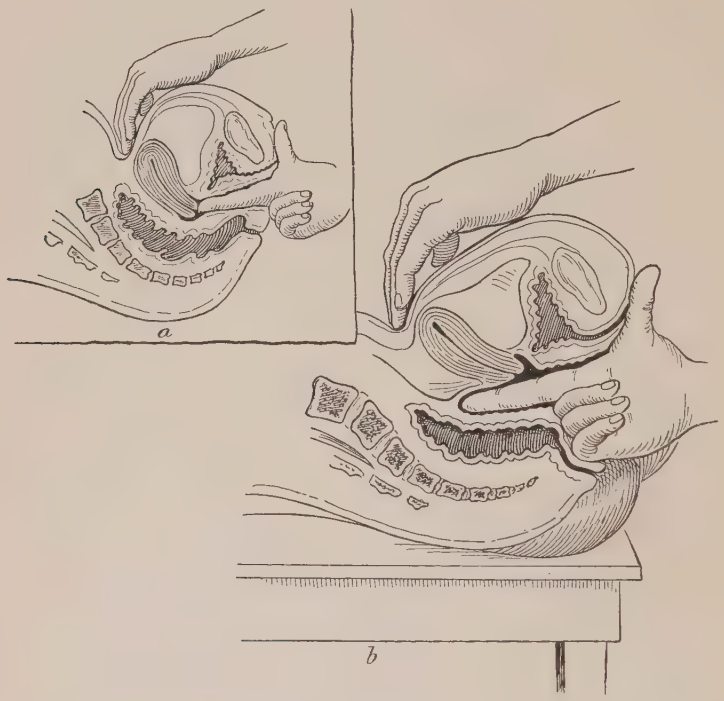

FIG. 20.—INVAGINATION OF THE PELVIC FLOOR (page 26).

Diagram *b* shows the tip of the fingers carried high up in the pelvis by pressure on the perineum with the knuckles of the examining hand. Diagram *a* shows the position of the tip of the finger, when the pelvic floor is not invaginated. Note the position of the tips of the fingers in the two diagrams and also the altered relations of the vagina, perineum, and rectum in *b*.

taught in a short time all that she is required to know from a practical stand point.

Examinations in which an anesthetic is used always require extra assistants, and the number depends upon what organs are to be investigated. A digital examination requires only one assistant and the anesthetizer. When the bladder and the ureters are to be examined, however, two assistants will be needed to support the patient if the knee-chest position is employed, whereas one is sufficient when the dorsosacral elevated posture is used.

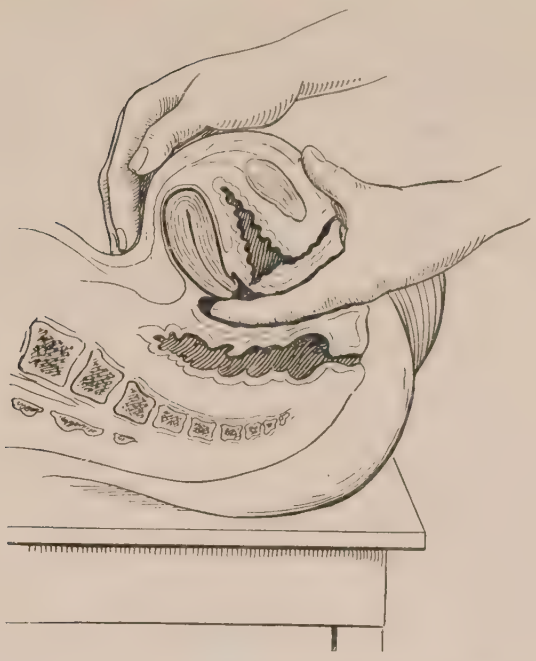

FIG. 21.—POSITION OF THE FINGERS OF THE EXTERNAL HAND IN MAKING A BIMANUAL EXAMINATION.

GYNECOLOGIC POSTURES.

The indications for the various gynecologic postures as well as their effect upon the position of the pelvic organs are referred to in discussing the methods of examining the different structures of the pelvis, and I shall therefore not speak of them here, as a general summary under the circumstances would necessarily at best be but incomplete.

The Patient's Clothing.—It is important before placing the patient on the examining table to have her clothing so arranged that there shall be no constriction over the abdomen or around the waist, and, as a rule, the corsets should be removed and the waistbands loosened. It is not necessary, however, to remove the drawers unless they are closed. In making an examination in a private house or at a hospital the patient should wear ordinary stockings or long canton flannel stockings which slip easily over the legs and reach to the middle of the thighs (Fig. 22).

Varieties.—The following postures are employed in making gynecologic examinations:

Dorsal position.
  (*a*) Dorsal elevated.
Dorsosacral position.
  (*a*) Dorsosacral elevated.
Erect position.
Knee-chest position.
  (*a*) Knee-chest elevated.
Lateral-prone position (right and left).
Horizontal recumbent position.

Dorsal Position.—Position of the Patient.—The patient is placed on her back with the hips at the edge of the table, the feet either resting on adjustable supporters or fastened in stirrups and the head and shoulders slightly raised on a pillow.

Arrangement of the Sheet and Clothing.—The patient is protected from exposure by throwing a sheet over the lower extremities and the abdomen and arranging the clothing beneath it. This is accomplished by pushing the skirts above the hips behind and over the knees in front. The lower edge of the sheet is then parted between the thighs so as to expose the vulva.

FIG. 22.—CANTON FLANNEL STOCKING (page 29).

FIG. 23.—DORSAL POSITION.

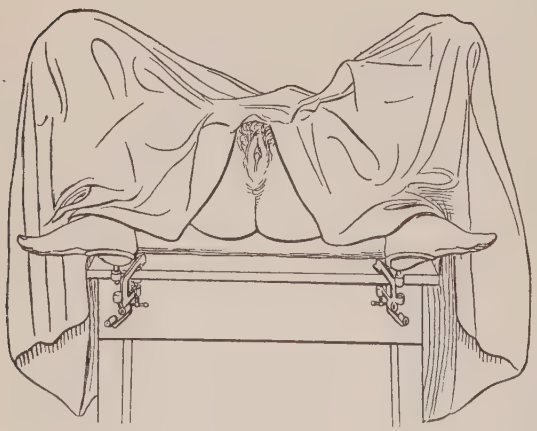

FIG. 24.—DORSAL POSITION WITH THE SHEET DRAPED TO EXPOSE THE VULVA.

(*a*) **Dorsal Elevated Position.**—The patient is placed in the ordinary dorsal position and after the sheet and clothing are properly arranged her shoulders are elevated with pillows.

Dorsosacral Position.—Position of the Patient.—The patient is placed on her back with the hips at the edge of the table, the head and shoulders resting on a pillow and the thighs strongly flexed on the abdomen and the legs on the thighs. The lower extremities are held in this position by

a sheet which is passed under the top of the table and its ends carried over the posterior surface of the thighs just above the knees and tied or secured with large safety-pins.

Another method consists in using a canvas leg-holder which is passed over the shoulders and attached to the thighs immediately above the knees (Figs. 27 and 28).

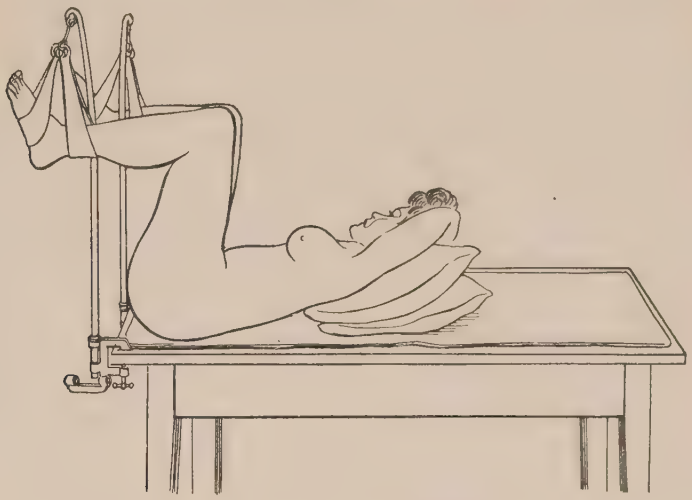

FIG. 25.—DORSAL ELEVATED POSITION.

Arrangement of the Sheet and Clothing.—This position is generally used when the examination is made at a private house or at a hospital, and consequently the patient does not have on her street clothes. She is protected from exposure by throwing a sheet over the abdomen and lower extremities before

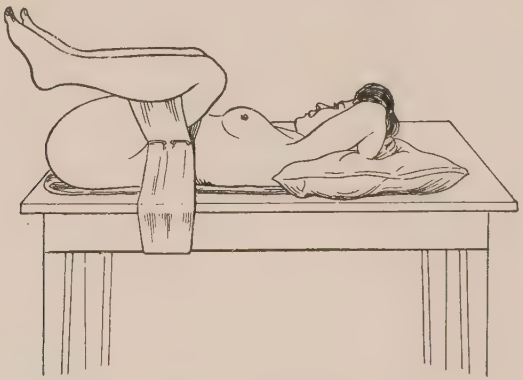

FIG. 26.—DORSOSACRAL POSITION WITH THE THIGHS SECURED BY A SHEET PASSED UNDER THE TABLE.

placing her in position. The hips are then brought down to the edge of the table and the lower extremities flexed on the abdomen and secured as directed above. The lower edge of the sheet is then separated at the vulva so as to expose the parts (Fig. 29).

(*a*) **Dorsosacral Elevated Position.**—The patient is placed in the ordinary dorsosacral position and the hips are then elevated twelve inches above the surface of the table with pillows.

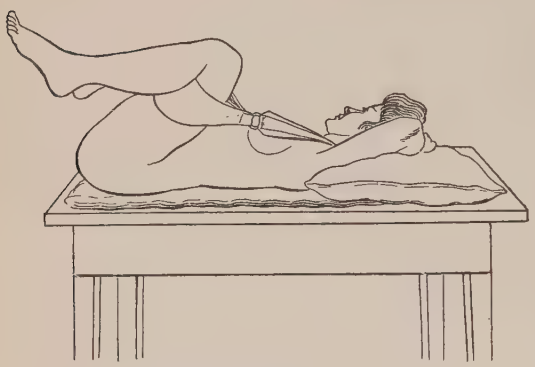

FIG. 27.—DORSOSACRAL POSITION WITH THE THIGHS SECURED BY ROBB'S LEG-HOLDER (page 31).

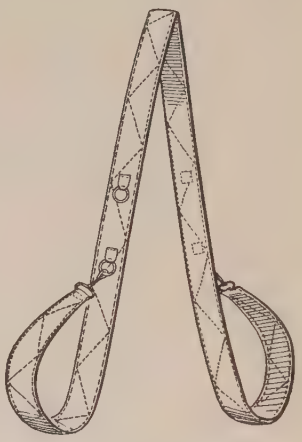

FIG. 28.—ROBB'S LEG-HOLDER.
The leg-holder is made of unbleached canton flannel and can be washed (page 31).

Erect Position.—Position of the Patient.—The patient stands erect with the right foot on the round of a chair, the right hand resting on the back

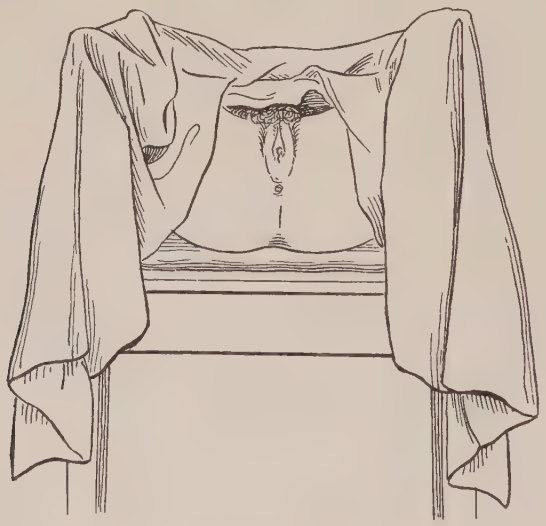

FIG. 29.—DORSOSACRAL POSITION WITH THE SHEET DRAPED TO EXPOSE THE VULVA (page 31).

of the chair and the left hand placed on the left hip, or she may stand with her back against the wall and the feet separated about eighteen inches.

Arrangement of the Sheet and Clothing.—A sheet which reaches to the floor is fastened around the patient's waist and secured with a safety-pin.

The physician then kneels on one knee in front of the patient and passes his hand under the sheet and clothing (Fig. 33).

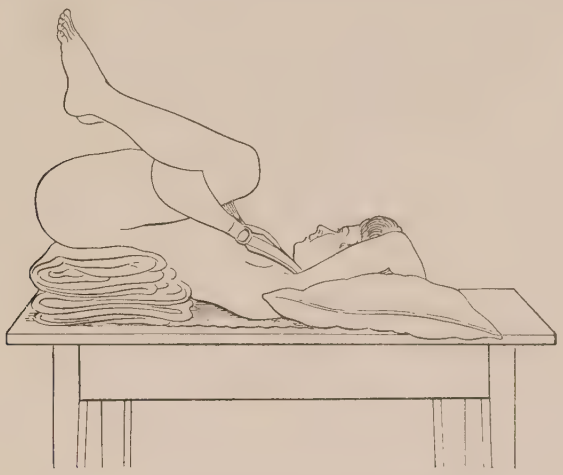

FIG. 30.—DORSOSACRAL ELEVATED POSITION.

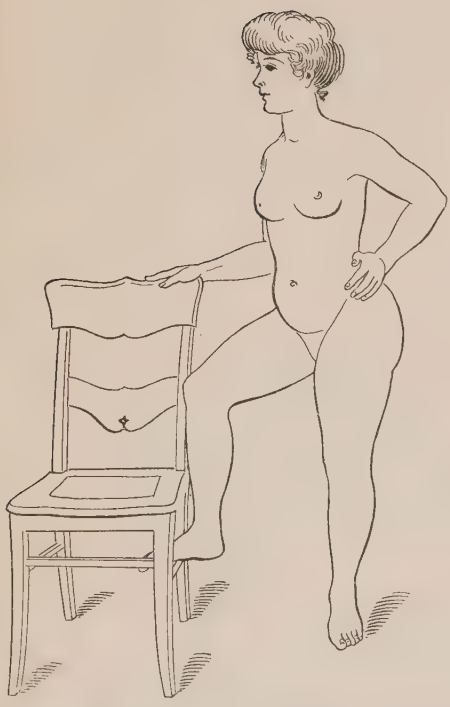

FIG. 31.—ERECT POSITION WITH THE RIGHT FOOT RESTING ON THE ROUND OF A CHAIR.

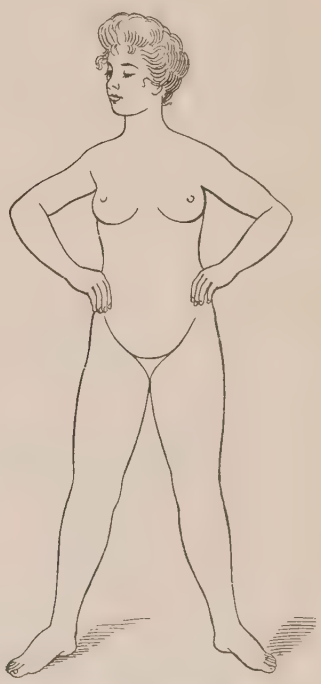

FIG. 32.—ERECT POSITION WITH THE BACK AGAINST THE WALL AND THE FEET SEPARATED.

Knee-chest Position.—Position of the Patient.—The patient should kneel on a table with her knees slightly separated and the feet projecting

FIG. 33.—ERECT POSITION WITH THE SHEET DRAPED TO PROTECT THE PATIENT FROM EXPOSURE DURING THE EXAMINATION (page 32).

over the edge. The side of the face is then placed on a soft pillow with the upper chest flat on the table and both arms thrown back. The thighs must be perpendicular to the surface of the table in

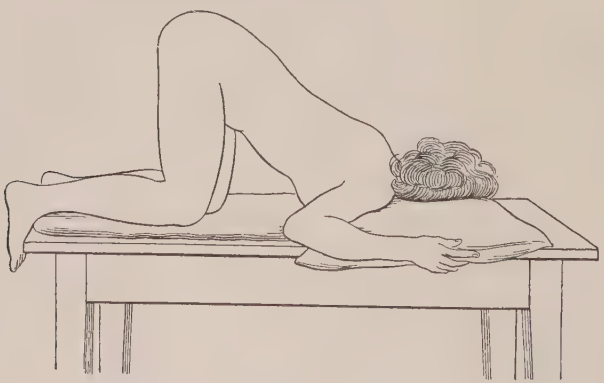

FIG. 34.—KNEE-CHEST POSITION.
The thighs must be perpendicular to the table so as to obtain the highest elevation of the pelvis.

order to obtain the highest elevation of the pelvis, and the chest must be as close as possible to the knees.

Arrangement of the Sheet and Clothing.—The patient is protected from exposure by throwing a sheet over the hips and back and separating it at the gluteal cleft to bring the vulva into view. If the examination is made at the

FIG. 35.—KNEE-CHEST POSITION WITH THE SHEET DRAPED TO EXPOSE THE VULVA.

physician's office, the skirts are drawn up over the patient's hips after the sheet has been thrown over her.

(*a*) **Knee-chest Elevated Position.**—The patient is placed in the ordinary

FIG. 36.—KNEE-CHEST ELEVATED POSITION.

knee-chest position and the pelvis is then raised higher by placing pillows under the knees.

Lateral-prone Position (right and left).—This position is also known as Sims's or the semi-prone position.

Position of the Patient.—The patient is placed on her right side at the edge of the table with her right arm behind her back and both knees drawn up toward the chest, the left being higher than the right and resting on the table.

FIG. 37.—RIGHT LATERAL-PRONE POSITION. ANTERIOR VIEW.

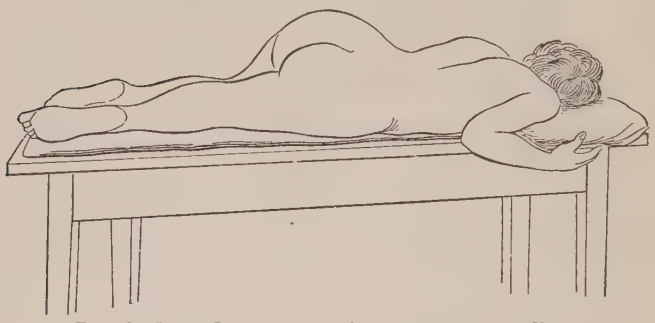

FIG. 38.—RIGHT LATERAL-PRONE POSITION. POSTERIOR VIEW.

In this position the body of the patient is tilted toward the table and supported by the chest and the abdomen.

Arrangement of the Sheet and Clothing.—The patient is protected from exposure by throwing a sheet over the lower extremities, the hips, and the abdomen, and arranging the clothing beneath it. This is accomplished by drawing the skirts up over the hips and separating the sheet at the gluteal cleft to expose the vulva.

FIG. 39.—RIGHT LATERAL-PRONE POSITION WITH THE SHEET DRAPED TO EXPOSE THE VULVA.

Horizontal Recumbent Position.—**Position of the Patient.**—The patient lies flat upon her back with the head resting on a pillow and the arms

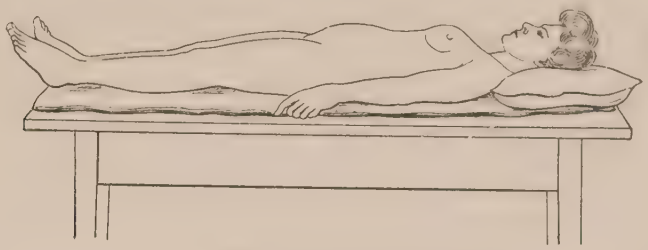

FIG. 40.—HORIZONTAL RECUMBENT POSITION.

at the side of the chest. The lower extremities are extended in a direct line with the long axis of the body and the heels placed in contact with each other.

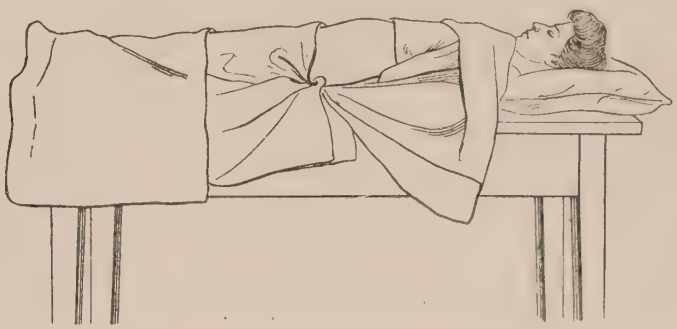

FIG. 41.—HORIZONTAL RECUMBENT POSITION WITH THE SHEET DRAPED TO EXPOSE THE ABDOMEN.

Arrangement of the Sheets and Clothing.—A sheet is thrown over the chest and another placed over the abdomen and lower extremities. The clothing is then drawn up to the chest and the upper edge of the lower sheet is tucked around the hips so as to leave the surface of the abdomen exposed to view.

CHAPTER II.

MICROSCOPIC AND BACTERIOLOGIC EXAMINATIONS.

It is often impossible for the surgeon to make a positive diagnosis in cases in which malignancy is suspected or to determine the variety of an infection or to ascertain the nature of a growth removed by an operation without the co-operation of the pathologist. In seeking his aid, however, the clinician must bear in mind that the microscope and the culture-tube are but adjuncts to the diagnostician's resources, and that they may not always be conclusive in their evidence.

The wide discrepancy, however, which occurs in many instances between the laboratory findings and the clinical diagnosis is more often the fault of the surgeon than of the pathologist or his methods, and it not infrequently happens that erroneous reports follow microscopic or bacteriologic examinations, because of the careless manner in which the material is collected and preserved.

It is not necessary nor expedient in a practical work on gynecology to attempt to give the technic by which the pathologist arrives at his conclusions, as the subject can only be properly treated in special works on pathology and bacteriology, and any information given along these lines in a book of this kind would not only be fragmentary in character but also very misleading to the reader. Furthermore, no mention will be made of the technic of a quick microscopic examination of tissue fragments by the freezing method, which is a valuable aid at times in determining the question of a more radical procedure during an operation in which malignancy is suspected; and, finally, no description will be given of the necessary apparatus or the technic by which the presence or absence of a leukocytosis can be ascertained, because both of these examinations require special laboratory training and study upon the part of the practitioner.

I shall therefore feel that my object has been accomplished if I succeed in bringing the practitioner as far as the threshold of the laboratory, and leave him there to seek admission well supplied with specimens that are properly selected, carefully preserved, and intelligently described.

The technic which will be given in this chapter for collecting and preserving material for examination is based upon the methods which are employed in the gynecologic service at the Medico-Chirurgical Hospital in Philadelphia.

MICROSCOPIC EXAMINATION OF TISSUES.

Specimens can be secured for examination by the following methods:

Curetment.
Excision of a fragment.
Removal of the entire growth.

CURETMENT.

Equipment.—The necessary instruments and operative paraphernalia are given under curetment of the uterus (see p. 955).

Technic.—The operative technic is also described under the same operation.

Collecting the Curet Findings.—An assistant stands at the side of the operator with a basin containing cold normal salt solution, and the tissue fragments and blood-clots are placed in it as the uterine cavity is cureted. After the operation is finished the solution is poured through two or three layers of gauze into another basin to remove the blood, and the tissue fragments which are caught in the improvised filter are then emptied into a third basin containing a fresh saline solution. The fragments of tissue, which can then be easily distinguished from the small masses of clotted blood, are picked out of the solution and placed at once in the preserving fluid. It is very important to secure all the curet findings, and this method of collecting them must be carefully followed, as the microscopic examination may be positive in only a few of the many fragments examined.

Preserving Fluid.—A 10 per cent. aqueous solution of formalin (40 per cent. aqueous solution of formaldehyd gas) is employed. The tissues will keep for any length of time and are always suitable for examination. The fragments should be placed in a relatively large bulk of the preserving fluid (*e. g.*, two ounces to a tissue bulk the size of a walnut) and the bottle in which the liquid is contained should be tightly corked and secured against leakage.

Shipment.—The bottle is securely wrapped in cotton batting, placed in a box, and sent by express to the laboratory.

Information for the Pathologist.—It is important that the practitioner should send with the material for examination a statement that the fragments were removed from the uterine cavity by curetment, and also a few notes of the clinical history of the case. Thus: Mrs. T., aged 42, white; the mother of three children. She was well until one year ago, when a miscarriage occurred which was followed by excessive bleeding at the menstrual periods and a profuse yellowish-white leukorrheal discharge. An examination of the uterus and its appendages gave negative results.

EXCISION OF A FRAGMENT.

In the majority of instances when a piece of tissue is excised for examination it is taken from the cervix in cases of suspected malignancy, and the technic therefore of this particular operation will serve as a guide when an excision for diagnostic purposes is made elsewhere.

Technic.—Preparation of the Patient.—No preliminary preparation is

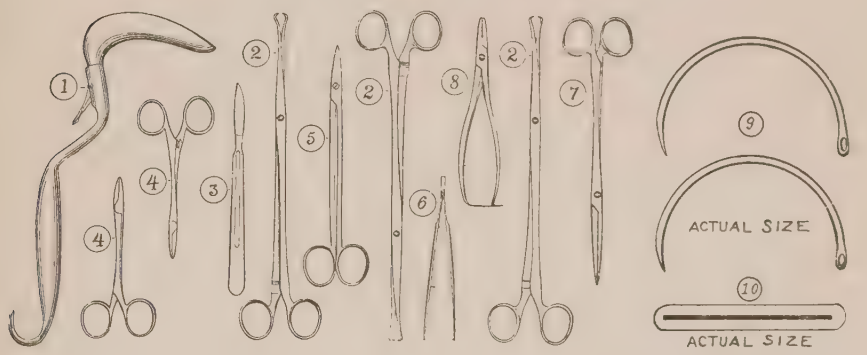

FIG. 42.—INSTRUMENTS, NEEDLES, AND SUTURE MATERIAL USED IN REMOVING A PIECE OF TISSUE FROM THE CERVIX FOR MICROSCOPIC EXAMINATION (page 40).

required, and the operation should be performed in the morning, about two or three hours after a light breakfast of toast and a cup of tea or coffee.

Anesthesia.—A general anesthetic should always be employed, as it is impossible otherwise to thoroughly sterilize the vagina.

Position of the Patient.—Dorsal posture.

Final Sterilization of the Patient.—See page 831.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse are required.

Dressings, Sponges, Towels, etc.—See page 832 for the contents of the conveyance boxes used in minor operations.

Instruments.—(1) Simon's speculum (curved blade); (2) three bullet forceps; (3) a scalpel; (4) two short hemostatic forceps; (5) a pair of scissors curved on the flat; (6) tissue forceps; (7) dressing forceps; (8) Hagedorn needle-holder; (9) two small full-curved Hagedorn needles; (10) No. 2 plain catgut (Fig. 42).

Operation.—The speculum is introduced into the vagina and the cervix exposed to view. The anterior and posterior lips are then caught with bullet forceps and drawn down toward the vaginal outlet. The portion of the

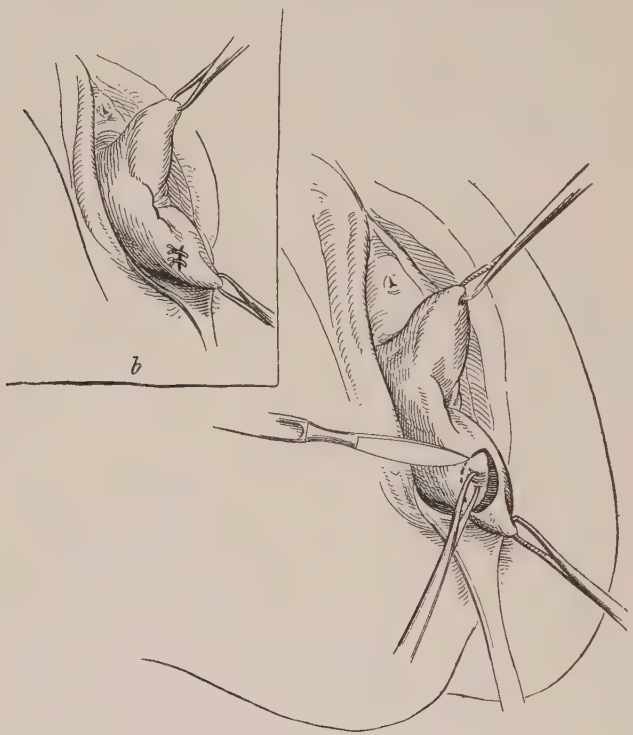

FIG. 43.—EXCISION OF A PIECE OF TISSUE FROM THE CERVIX.
The cervix is shown pulled down into the vulvar opening and a wedge-shaped piece of tissue being excised. Note the appearance of the wound in diagram *b* after the sutures have been introduced and tied.

cervix to be removed is now seized with a third pair of bullet forceps and a broad, wedge-shaped piece of tissue excised with a scalpel or scissors. The edges of the wound are then united with one or two catgut sutures and the uterus pushed back into the pelvic cavity.

The vagina is finally irrigated with a corrosive sublimate solution (1 to 2000) followed by sterile water and dried with a gauze sponge. A gauze sponge is then unfolded and loosely packed against the cervix and the vulva protected with a gauze compress secured by a T-bandage.

Special Directions.—Judgment must be exercised in selecting the portion of the cervix to be removed for microscopic examination. When the cervix

is indurated and hypertrophied, the piece of tissue must be removed from where the pathologic changes are most marked; and when a distinct nodule is present, it must be included in the excised portion. If the cervix is ulcerated or eroded, the wedge-shaped piece must be cut directly from its center; and if a small outgrowth is present on the cervix, it should be removed by excising its base.

Variations in the Technic.—In a doubtful case it may be expedient to amputate the entire cervix and subject the tissues to a microscopic examination. Under these circumstances the operation of amputation of the cervix is performed as described on page 459.

After-treatment.—Care of the Wound.—The vulvar compress is temporarily removed when the bowels and bladder are evacuated. The tampon is taken out at the end of twenty-four hours and the vagina irrigated daily with a solution of corrosive sublimate (1 to 2000) followed by sterile water.

The Bladder.—The urine should be voided naturally.

The Bowels.—The bowels should be moved daily with a mild laxative.

The Diet.—During the first twenty-four hours a liquid diet (see p. 106) should be given and then the patient should be placed upon a convalescent diet (see p. 114).

Getting Out of Bed.—The patient should remain in bed from five days to one week.

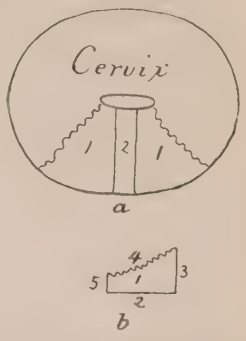

FIG. 44.—ROUGH SKETCH SHOWING THE POSITION AND RELATIONS OF THE EXCISED PIECE OF CERVICAL TISSUE.

Diagram *a* shows the area of ulceration (1) and the position which the fragment of tissue occupied (2). Diagram *b* shows the excised fragment (1) and its original relations with the cervix as follows: The deep portion (2); the edge in relation with the cervical canal (3); the ulcerated area (4); the outer aspect (5).

Preserving Fluid.—As soon as the piece of cervical tissue is excised it should be placed in a bottle containing a 10 per cent. aqueous solution of formalin.

Shipment.—The bottle is packed in the same way as recommended for curet findings and sent by express to the laboratory.

Information for the Pathologist.—The excised piece of cervical tissue must be accompanied by a brief clinical history and by a description of the appearance of the cervix as well as a rough diagram showing from what part of the cervix it was removed. Thus: Suspected cancer of the cervix. Mrs. G., aged 40, white; the mother of five children. Always well until seven months ago, when she began to have slight irregular hemorrhages from the uterus, which have increased in severity and are associated with a foul-smelling leukorrheal discharge. The examination revealed a ragged and indurated ulceration with small papillary excrescences on the right side of the posterior lip of the cervix. From this ulcerated portion a wedge-shaped piece of the cervical tissue was excised as shown by the following diagrams (Fig. 44).

REMOVAL OF THE ENTIRE GROWTH.

Technic.—After the growth has been removed it should be washed in normal salt solution and placed at once in a bottle containing the preserving fluid.

Preserving Fluid.—A 10 per cent. aqueous solution of formalin is used.

Shipment.—The bottle is packed in the same way as recommended for curet findings and sent by express to the laboratory.

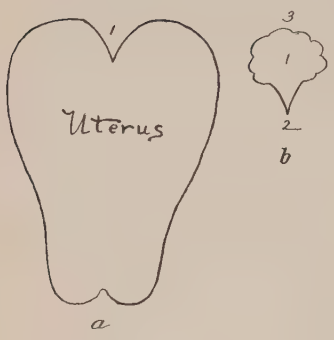

FIG. 45.—ROUGH SKETCH SHOWING THE RELATIONS OF THE TUMOR WITH THE UTERUS.

Diagram *a* shows the uterus and the position which the tumor occupied (1). Diagram *b* shows the tumor (1) and its original relations with the uterus as follows: The base (2); the surface of the growth (3).

Information for the Pathologist.—The growth should be accompanied by a statement informing the pathologist from where it was removed and by a brief clinical history. Thus, the tumor was removed from the left labium majus. Mrs. H., 28 years of age, white. She is in good health at the present time. Two years ago she noticed a small tumor on the vulva which has been growing slowly.

When an entire organ is removed and sent to the laboratory it is always best to state what organ it is, as it may be distorted by disease and unrecognizable macroscopically.

When a tumor is removed from an organ, it should be accompanied by a diagram, as recommended in cases where a piece of tissue is excised from the cervix. For example, if the growth was taken from the fundus of the uterus, the diagrams in figure 45 will explain its relations.

MICROSCOPIC EXAMINATION OF DISCHARGES.

Equipment and Instruments.—(1) One dozen glass slides; (2) a small alcohol lamp; (3) a delicate steel or silver applicator; (4) Simon's speculums (flat and curved blades); (5) two bullet forceps; (6) dressing forceps; (7) urethral dilator, No. 33, French scale.

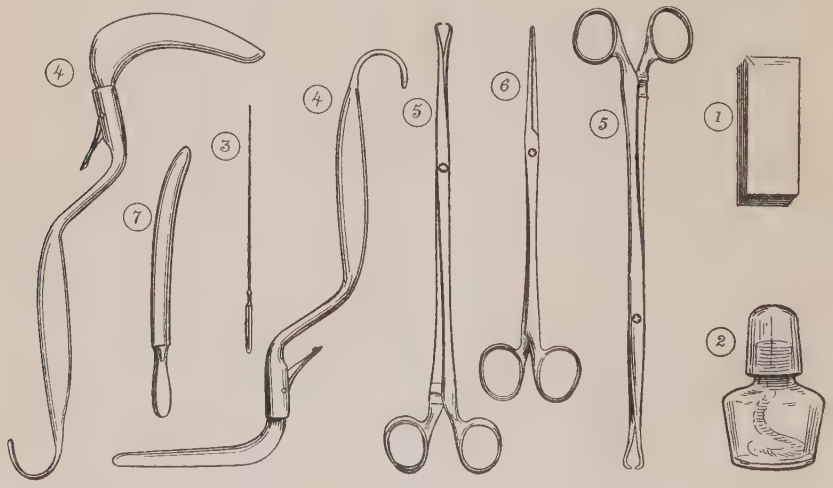

FIG. 46.—EQUIPMENT AND INSTRUMENTS USED IN SMEARING DISCHARGES ON GLASS SLIDES FOR MICROSCOPIC EXAMINATION.

Each slide should be numbered by gluing a small piece of paper on one end with the number written on it.

Absorbent Cotton.—Small pledgets of absorbent cotton should be at hand to wrap around the end of the applicator.

Technic.—Preparation of the Patient.—There should be no preliminary cleansing or douching of the parts and the urine should not be voided for at least three hours prior to the examination.

Position of the Patient.—Dorsal posture.

Antisepsis.—The glass slides should be wiped clean with a damp sterile towel and the instruments and cotton sterilized by the usual methods.

Arrangement of the Equipment and the Instruments.—The glass slides should be spread out on a sterile towel in the order of their numbers (1, 2, 3, 4, etc.); the alcohol lamp lighted and the cotton and instruments placed in their respective trays on the table.

FIG. 47.—NUMBERED GLASS SLIDE WITH A THIN TRANSPARENT FILM OF SECRETION SMEARED ON ITS SURFACE.

Method of Smearing the Slides.—The end of the applicator is wrapped with a thin film of cotton and dipped into the discharge, which is then smeared over the center of the slide for a space of about one square inch. The slide is then put back on the table and allowed to dry. The smear should be thin and transparent. The slides should be smeared in the order of their numbers and a record kept of where the discharges were collected. Two slides should be used for each locality from which the discharges are secured, and the record should read as follows: Nos. 1 and 2 from vulva; Nos. 3 and 4 from the urethra; Nos. 5 and 6 from the glands of Skene; Nos. 7 and 8 from the orifices of the vulvovaginal glands; Nos. 9 and 10 from the vagina; and Nos. 11 and 12 from the cervical canal.

FIG. 48.—FORCING THE DISCHARGE OUT OF THE URETHRA BY PRESSURE AGAINST THE CANAL WITH THE TIP OF THE FINGER IN THE VAGINA.

After collecting the discharge from one locality the end of the applicator must be resterilized before using it again in another situation by placing it in the alcohol flame and wrapping it with a fresh film of cotton.

Method of Collecting the Discharge.—The discharges are collected from the different parts of the genito-urinary tract as follows.

V u l v a .—The examiner separates the labia with the thumb and index-finger of the left hand and passes the applicator over the surface of the vulvar canal where the secretions have collected.

U r e t h r a .—The discharge is obtained by introducing the index-finger into the vagina and pressing it against the urethra, at the same time drawing the tip of the finger toward the meatus. The discharge now appears at the external meatus and can be easily collected by dipping the end of the applicator into it. If the discharge is so slight that it cannot be forced out at the meatus, it can be collected by passing the applicator into the urethral canal; care, however, being taken n o t to e n t e r t h e b l a d d e r on account of the danger of infection.

Glands of Skene.—The openings of the two urethral ducts are situated about one-eighth of an inch within the meatus on the floor of the urethra. They are readily seen in parous women, as the mucous membrane is always somewhat everted, but in nulliparæ it is necessary to dilate the meatus and draw its lips apart before they are exposed to view. The discharge is first wiped away from the mouth of the urethra with a pledget of cotton and pressure is then made from below upward upon the glands with the tip of the index-finger placed within the vagina just above the meatus. The secretion is now collected by passing the end of the applicator over the floor of the urethra.

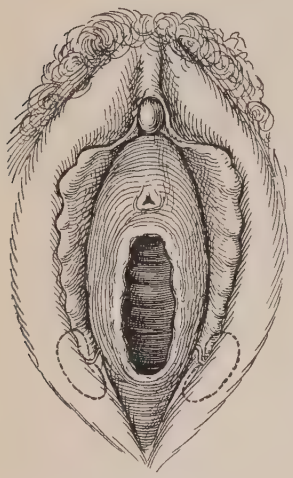

Fig. 49.—Situation of the Vulvovaginal Glands.

Vulvovaginal Glands.—The secretions are first wiped away from the orifices of the glands, which are located "just in front and outside of the hymen on the inside of the labia majora or labia minora, if these extend so far back." The examiner then presses with his finger upon the glands and along the course of their ducts and collects the discharge upon the end of the applicator. If the ducts are patulous, which is sometimes the case, the applicator can be passed into them for a short distance.

Vagina.—The secretions are first wiped away from the vulvovaginal orifice and the speculums introduced into the vagina. Specimens of the discharge are then collected upon the applicator from all suspicious patches of inflammation and from the posterior vaginal fornix.

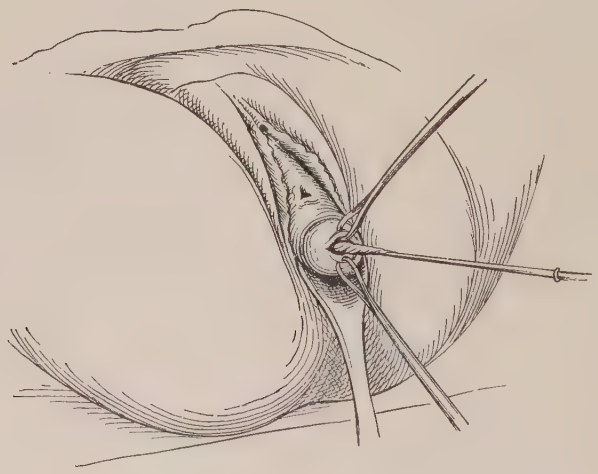

Fig. 50.—Method of Collecting the Secretions from the Uterus.

Uterus.—Simon's speculum is introduced into the vagina, the cervix exposed, and the anterior and posterior lips seized with bullet forceps. The discharges are then wiped away from the os uteri and the applicator passed up

in the cervical canal. The applicator should not pass beyond the internal os for fear of infecting the endometrium in case it has escaped infection.

Shipment.—After the slides are dry they are placed one upon another with match-sticks between them to prevent the smears from rubbing and secured with two rubber bands. They are finally wrapped in cotton batting, placed in a box, and sent by express to the laboratory.

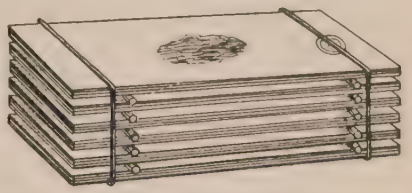

FIG. 51.—GLASS SLIDES SEPARATED BY MATCH-STICKS AND HELD TOGETHER WITH RUBBER BANDS READY FOR SHIPMENT TO THE LABORATORY.

Information for the Pathologist.—A copy of the record which was taken when the smears were made, giving the localities from which the discharges were secured, should be sent to the pathologist in order that he may indicate in his report the microscopic findings of each slide by its number.

BACTERIOLOGIC EXAMINATION OF DISCHARGES.

Equipment and Instruments.—(1) Six sterile glass pipets; (2) one foot of rubber tubing with an external diameter of one-quarter of an inch and a half-ounce hard-rubber syringe; (3) Simon's speculums (flat and curved blades); (4) two bullet forceps; (5) straight scissors; (6) dressing forceps; (7) a small alcohol lamp.

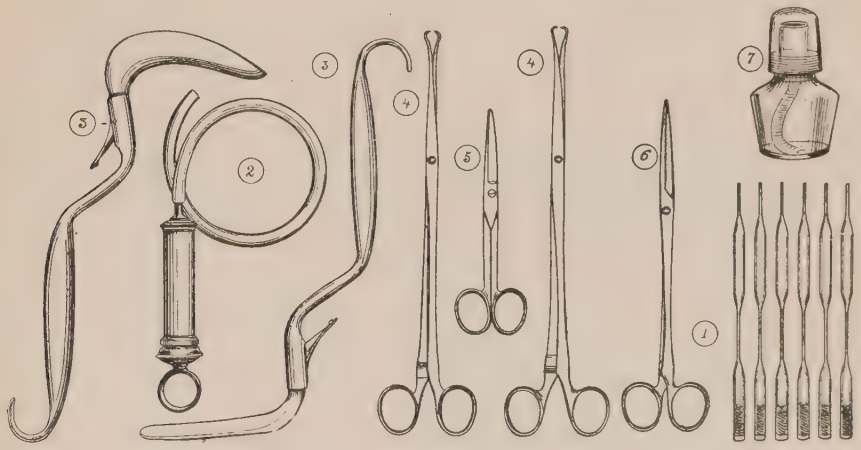

FIG. 52.—EQUIPMENT AND INSTRUMENTS USED IN COLLECTING DISCHARGES FOR BACTERIOLOGIC EXAMINATION.

Absorbent Cotton.—Sterile absorbent cotton should be on hand to wipe away secretions when required.

The Pipets.—The glass pipets are not manufactured for glass dealers and the practitioner must either make them himself, which is readily done, or else procure them from a pathologic laboratory. They are made as follows:

1. Take a piece of glass tubing six inches long with an external diameter of one-quarter and an internal diameter of one-eighth of an inch. This tube makes two pipets (Fig. 53).

2. Heat the tube at its center over a Bunsen burner and keep rotating it until the glass is very soft.

Then remove it from the flame and gently draw it out until a small tube about four inches long with a diameter of the lead in a pencil is made.

FIG. 53.—GLASS TUBING (page 45).

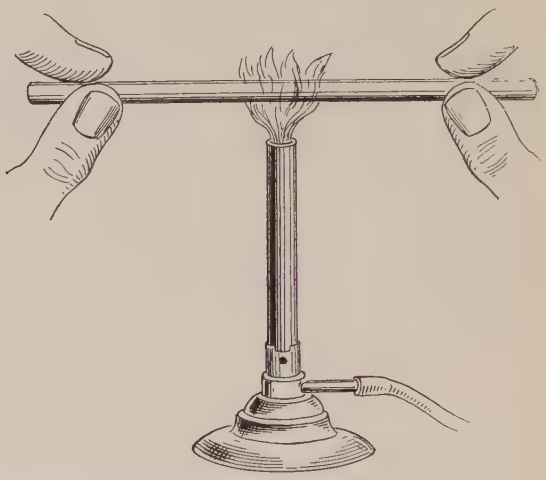

FIG. 54.—HEATING THE GLASS TUBE AT ITS CENTER OVER A BUNSEN FLAME.

FIG. 55.—THE GLASS TUBE IS SHOWN DRAWN OUT AT ITS CENTER.

3. The drawn-out portion is then placed in the flame and fused apart at its center; we have now two pipets sealed at their points.

4. Each of these pipets is finally made into a bulbous pipet by heating the thick portion of the tube at its center in the flame and drawing it out to a thin tube two and a half inches long.

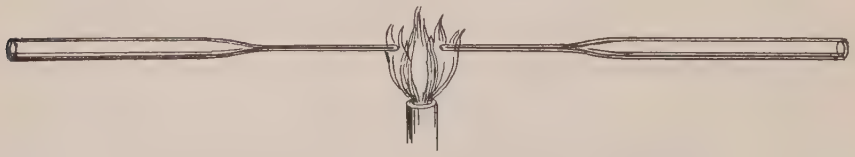

FIG. 56.—FUSING APART THE CENTER OF THE DRAWN-OUT PORTION OF THE TUBE.

FIG. 57.—TWO PIPETS SEALED AT THEIR POINTS.

The practitioner should keep on hand one dozen sterilized pipets ready for use. They are sterilized as follows:

1. Plug the thick end of the pipet with a pledget of cotton batting (Fig. 61).

2. Hold the thick end (*d*) in the fingers and pass the bulbous portion (*b*) and the slender end (*a*) through the flame until it gets very hot, but not soft (Fig. 59).

Now place the pipet on the table until it cools and then pass the thick

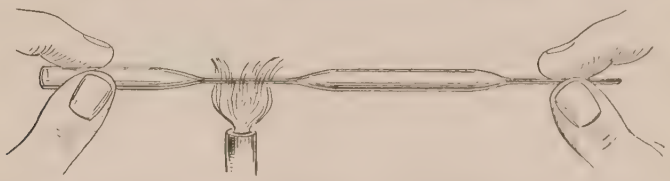

Fig. 58.—Making a Bulbous Pipet by Heating the Thick Portion and Drawing It Out to a Thin Tube.

end (*d*) and the slender part (*c*) through the flame until the plug of cotton becomes slightly brown (Fig. 60).

The entire inner surface of the pipet is now sterile and will remain so in-

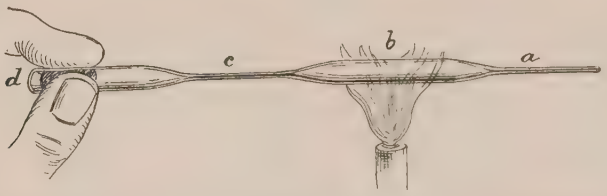

Fig. 59.—Sterilizing the Interior of the Bulbous Portion (*b*) and the Slender End (*a*) of the Pipet.

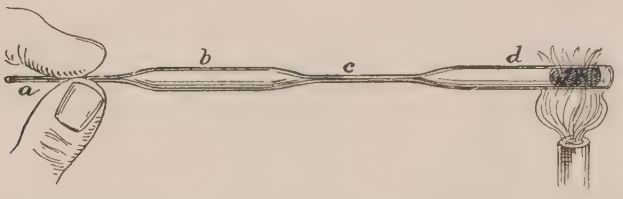

Fig. 60.—Sterilizing the Interior of the Thick End (*d*) and the Slender Part (*c*) of the Pipet.

definitely unless the cotton plug is disturbed. In sterilizing the thick end of the pipet care must be taken not to overheat it, as the cotton will be burned and the oil contained in its fibers will be condensed and run down the inside of

Fig. 61.—Shows the Number Pasted on the Bulbous Portion of the Pipet (page 48). Note the plug of cotton batting in the thick end (*d*). A properly sterilized pipet can be kept indefinitely, as the cotton plug prevents the entrance of germs.

the tube. If this happens, the plug becomes useless, and a fresh pledget of cotton batting must therefore be inserted into the end of the pipet. It should always be borne in mind that as soon as the cotton becomes slightly brown the sterilization of that portion of the tube is complete, and that any further

application of heat will destroy the usefulness of the plug as a protection against the entrance of germs into the pipet. Each pipet should finally be num-

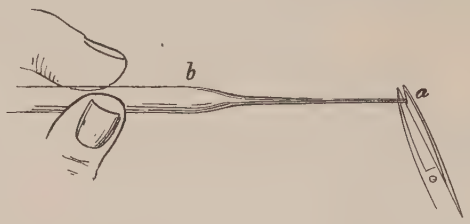

FIG. 62.—SNIPPING OFF THE FUSED POINT OF THE SLENDER END (*a*) OF THE PIPET WITH SCISSORS (page 49).

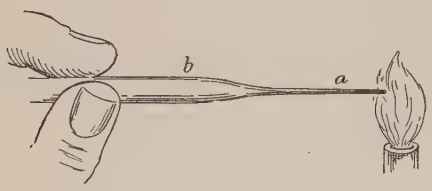

FIG. 63.—ROUNDING OFF THE ROUGH EDGES OF THE GLASS IN THE FLAME (page 49).

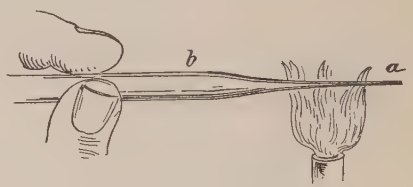

FIG. 64.—STERILIZING THE OUTER SURFACE OF THE SLENDER END (*a*) OF THE PIPET (page 49).

bered by gluing a small piece of paper on the bulbous portion of the tube with the number written on it (Fig. 61).

Technic.—Preparation of the Patient.—There should be no prelimi-

FIG. 65.—METHOD OF SUCKING THE URETHRAL SECRETIONS INTO THE BULBOUS PORTION OF THE PIPET (page 49).

nary douching of the parts and the urine should not be voided for at least three hours prior to the examination.

Position of the Patient.—Dorsal posture.

Arrangement of the Equipment and Instruments.—The pipets are spread out on a towel in the order of their numbers (1, 2, 3, 4, etc.), the alcohol lamp lighted, and the sterilized cotton and instruments placed on a table along with the rubber tubing and the syringe.

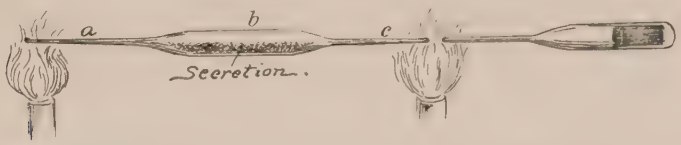

FIG. 66.—HERMETICALLY SEALING THE SECRETIONS IN THE BULBOUS PORTION OF THE PIPET BY FUSING IT IN THE FLAME AT *a* AND *c*.

Method of Collecting the Discharges.—The fused point of the slender end (*a*) of No. 1 pipet is snipped off with scissors and the rough uneven margins of the glass are then rounded by placing them in the edge of the flame, being careful, however, not to fuse the glass and close the opening. Unless the sharp edges of the end of the pipet are rounded off, there is always danger of injuring the tissues and making a false passage.

The entire length of the slender end (*a*) is now passed several times through the flame to sterilize its outer surface.

The pipet is now connected with the syringe by slipping the rubber tube over its thick end. The syringe is held in the left hand and the pipet in the right, and the slender end is then placed in the discharge, which is sucked up into the bulbous portion of the tube by drawing out the piston with the thumb.

The pipet is then removed from the rubber tube and its slender end (*a*) closed by fusing it in the flame; the

FIG. 67.—SHOWING THE BULBOUS PORTION OF THE PIPET SEALED AND CONTAINING THE SECRETION.

other end of the bulbous portion (*c*) is then sealed by melting the tube in the flame at point *c*.

The discharge is now hermetically sealed in the bulbous portion of the pipet.

This is then laid aside and the next pipet used in the same way to collect the secretions from another locality. A record should be kept indicating where the discharge is from in each pipet.

FIG. 68.—THE BULBOUS PORTION OF THE PIPETS PLACED IN A TEST-TUBE READY FOR SHIPMENT TO THE LABORATORY (page 50).

If the secretions are profuse, they can be collected from the urethra, the vulva, the vagina, and the cervical canal as follows:

V u l v a .—The assistant separates the labia while the examiner places the distal end of the pipet in the secretion and sucks it up into the bulbous portion of the tube.

U r e t h r a .—The assistant separates the labia and the examiner introduces the pipet into the urethra, sucking up the secretion as it slowly passes

along the canal. The pipet must not be passed into the bladder on account of the danger of infection.

Vagina.—The secretions are wiped away from the vaginal orifice and the speculums introduced into the vagina. The pipet is then passed into the posterior culdesac and the discharge sucked up into the tube.

Uterus.—Simon's speculums are introduced into the vagina, the cervix exposed, and the anterior and posterior lips seized with bullet forceps. The discharges are then wiped away from the os uteri, the pipet introduced into the cervical canal, and the secretions slowly drawn into the tube.

Other Localities.—If the orifices of the vulvovaginal or Skene's glands are patulous, the discharges can readily be sucked into the pipet by introducing its slender end into the ducts, and secretions can also be collected from sinuses or false passages in any part of the genito-urinary tract, as well as from abscesses, cavities, and cysts opened at the time of an operation.

Shipment.—The hermetically sealed bulbous portion of the pipets can be safely sent by express to the laboratory in an ordinary test-tube which is packed in a box stuffed with cotton. The test-tube is first lightly packed with cotton at the bottom, and after the pipets have been placed in it the end is closed by a plug of the same material (Fig. 68).

Information for the Pathologist.—A copy of the record which was taken when the discharges were collected should be sent to the pathologist in order that he may indicate in his report the bacteriologic findings of each pipet by its number.

CHAPTER III.

THE BLOOD IN RELATION TO SURGERY.

COMPOSITION OF THE BLOOD.

The blood is composed of (1) the *fluid portion* and (2) the *corpuscular elements*.

The Fluid Portion.—The fluid portion of the blood is known as *liquor sanguinis* or *plasma*, and is undoubtedly closely connected with the processes of elimination, metabolism, and nutrition, besides playing an important part in protecting the system from the influence of morbid agents. It contains about 10 per cent. of solid matter which includes the proteids—fibrinogen, serum albumen, and serum globulin, and, in addition, various salts, of which the chlorid of sodium is the most abundant.

The Corpuscular Elements.—This portion of the blood consists of (*a*) red cells or erythrocytes, (*b*) white cells or leukocytes, (*c*) blood-plaques, and (*d*) hemoconia or blood-dust.

Red Corpuscles.—The erythrocytes carry the oxygen from the lungs to the tissues of the body and contain the hemoglobin. About 4,500,000 to 5,000,000 red corpuscles to a cubic millimeter of blood is taken as the normal standard.

White Corpuscles.—The leukocytes are supposed by their bactericidal action to protect the system from the invasion of morbid influences and to assist in the elimination of products resulting from infection, irritation, or tissue metamorphosis. The number of white corpuscles to a cubic millimeter of blood in a healthy individual ranges from 5,000 to 10,000, but if we take the data given by a number of authorities, the normal average is found to be about 7,500.

Six different varieties of leukocytes are found in normal blood, and the number is increased in certain pathologic conditions, as, for example, the presence of myelocytes in the spleno-medullary form of leukemia and of mononuclear neutrophiles in the general paralysis of the insane. The following table, taken from DaCosta's work on Hematology, gives the names of the different varieties of normal leukocytes together with their relative percentages and number to the cubic millimeter of blood.

Variety.	Per Cent.	Number Per Cubic Millimeter.
Small lymphocytes	20–30	1,000–3,000
Large lymphocytes and transitional forms	4–8	200– 800
Polynuclear neutrophiles	60–75	3,000–7,500
Eosinophiles	0.5–5	25– 500
Basophiles	0.5	25

Blood Plaques.—These are small spherical bodies which are supposed to be derived either from the corpuscular or fluid elements of the blood. Their function is but little understood, although they are thought to play a part in the formation of a blood-clot or a thrombus. The number of plaques to the cubic millimeter of normal blood is about 300,000, but they may range from 180,000 to 500,000 and still be within the limits of health.

Hemoconia.—These are small highly refractive bodies which are constantly present in both normal and abnormal blood. Various theories have been advanced as to their origin and function, but as yet nothing definite has been discovered and their presence in the blood is therefore without clinical significance.

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GENERAL CONSIDERATIONS.

The brilliant results that have been accomplished from the examination of the blood in its relation to medical and surgical diseases have not only resulted in marked scientific advancement, but have also placed in the hands of the physician and surgeon a method of investigation which is of decided practical value in the diagnosis and treatment of many affections that are obscure and about which but little is known. So far as surgical conditions are concerned, the blood findings are not pathognomonic in character and are too contradictory and conflicting to be relied upon as the sole means of making a positive diagnosis. Taken in connection, however, with the clinical picture or viewed simply in the light of an additional method at our disposal to diagnose and combat disease, the study of the blood at once becomes of utmost importance, and it is therefore essential to take advantage of the knowledge which may be derived from this source.

A variable degree of pathologic change may occur in the blood of persons suffering from different forms of disease of a surgical nature: yet these changes may not extend beyond the extreme normal limits for such individuals during health, when under the influence of conditions that excite wide physiologic fluctuations in the character of both the red and white cells. Again, environment, diet, exercise, hot and cold baths, starvation, and the presence of conditions materially influencing the general nutrition of the patient are capable of inducing blood-changes that simulate closely and are often indistinguishable from those developing as the result of some surgical condition.

Positive findings from a blood-examination have been demonstrated to be of great value in many instances, as shown by the leukocyte count in the surgical complications of typhoid fever, suppurative conditions, general sepsis, and malignant disease, as well as indicating whether a morbid process is diminishing or increasing in severity. In bacteriologic examinations of the blood positive results are conclusive evidence of the nature of the disease and the character of the infection. A knowledge of the percentage of the hemoglobin or the rapidity of coagulation of the blood is of great value in determining upon the question of an operation in cases in which there is a tendency toward hemorrhage, and under these circumstances a fatal result from shock or loss of blood may be averted by a systematic course of treatment before resorting to surgical interference.

Negative findings from a blood-examination are, as a rule, of but little value, and should not be relied upon in the diagnosis of surgical conditions. Thus, for example, an encapsulated focus of pus is not attended with a leukocytosis, and we do not always find an increase in the number of white cells in cases of malignant disease.

In a general consideration of the subject of hematology it is fair to state that, as a rule, all chronic surgical conditions induce a mild and at times a severe grade of secondary anemia, affecting first the hemoglobin and later the red cells, with or without marked changes in the leukocytes.

Acute inflammatory processes are capable of exciting an increase in the number of leukocytes, and this increase usually involves the polynuclear elements. Yet numerous exceptions are to be encountered, *e. g.*, gonorrheal inflammation, when it extends to the deep male urethra and to the prostate region, is accompanied by an increased number of eosinophiles. Appendiceal, tubal, ovarian, and pelvic inflammations and even abscesses are so commonly encysted by firm fibrous adhesions that their existence is often not even suggested by the blood-findings. The blood-changes are very slight in acute and chronic inflammations of the mucous membranes, but when the serous membranes are involved a leukocytosis is excited, and if the disease is protracted a decided blood dyscrasia results.

It is impossible to estimate the degree of blood-changes induced by fever, and since the toxic products of many pathogenic bacteria have been shown to possess the power of producing a vasoconstrictor action, it is fair to presume that the polycythemia of certain surgical disorders may be due in part at least to this specific action of bacterial toxins. Cyanosis is one of the commonest sources of error in hematologic research and probably explains the conflicting statements commonly made regarding the blood-findings in all forms of disease. Again, purging and hemorrhage cause a concentration of the blood in direct correlation to the degree of fluids extracted from the body. Ether anesthesia for similar reasons, and possibly from its toxic effects upon the economy, as well as the irritation it offers to the bronchial mucosa, excites a moderate and often a decided leukocytosis. Ether also causes a decided reduction in the amount of hemoglobin.

The injection of large quantities of normal salt solution either beneath the skin or directly into a vein modifies the osmotic tension of the serum, and in this way is accountable for many of the pathologic changes common to the blood after hemorrhage. It is therefore of the utmost importance from a clinical point of view that conditions capable of producing either concentration or dilution of the blood be taken into account in conjunction with the blood-findings in all surgical and medical affections.

LEUKOCYTOSIS.

Definition.—Leukocytosis is an increase in the number of leukocytes in the blood. In the most frequent form of the affection the polynuclear neutrophiles are increased, while there is a relative lessening in the proportion of the other leukocytes, and in rare instances there may be a general increase in all the white cells without disturbing the proportionate number of each.

Leukocytosis may be either *temporary* or *continuous*, according to the acute or chronic nature of the cause.

Clinical Varieties.—Clinically two forms of leukocytosis are recognized: the *physiologic* and *pathologic* varieties of the affection.

Physiologic Leukocytosis.—This is a term applied to an increase in the number of leukocytes due to a physiologic cause. As a rule, the leukocytosis is temporary and of brief duration and the degree of increase in the leukocytes is always moderate. It may affect the polynuclear neutrophiles alone or there may be a general increase in the number of all the leukocytes.

This condition occurs in infants during the first two weeks after birth, in pregnancy and parturition, during digestion, especially when the food is rich in albuminoids, and after active muscular exercise. Hot and cold baths, massage, and electricity also produce leukocytosis, and a moderate increase of white cells frequently takes place a few hours before death.

Pathologic Leukocytosis.—This is a term applied to an increase of the leukocytes due to a wide variety of pathologic conditions. The affection is *temporary* when the cause is acute, or *permanent* when the exciting factor is incurable. The number of leukocytes to the cubic millimeter of blood in a mild or moderate case of leukocytosis is below 16,000, whereas in a marked case the count will be between 20,000 and 25,000, and above that number the condition would be considered severe. An increase to 10,000 would be of no clinical significance whatever, as the number of leukocytes often reaches that high in health.

Causes.—In *physiologic* leukocytosis the actual number of white cells in the blood is not increased and the high leukocyte count is due to the concentration of the blood in the peripheral vessels as the result of a high arterial tension.

In *pathologic* leukocytosis, on the other hand, there is an actual increase in the white corpuscles, which are probably drawn into the circulation through a positive chemotactic influence exerted by the chemic substances which are present in the blood and produced by the infecting organisms. Having thus increased in number, the invading micro-organisms are possibly destroyed by the process of phagocytosis and the bactericidal action of the substances produced by the leukocytes.

Significance.—Leukocytosis is a conflict between two opposing forces—infection and resistance, and if we constantly bear this fact in mind, the blood-findings will often be of incalculable value in surgical affections. The grade of a leukocytosis depends upon the virulence of the infection on one hand and the strength of the resistance on the other. Thus a mild infection with a good resistance results in a moderate leukocytosis, and a severe infection with a strong resisting power produces a high leukocytosis. If, on the other hand, the resistance is poor and the infection virulent, the organism, becoming suddenly overwhelmed by the poison, offers no resistance to the invading micro-organisms and consequently there is usually a decrease (*leukopenia*) instead of an increase in the white cells. These facts have an important bearing at times upon the prognosis of surgical affections, because the leukocyte count indicates the re-

sisting power of the patient and determines the question of operative interference or the chances of ultimate recovery. For example, if leukopenia or a decrease in the white cells is present in a severe case of peritonitis, operative interference is out of the question, as the chances of recovery under these circumstances are almost *nil*. If, on the other hand, there is a decided leukocytosis present, the prognosis is more or less favorable, because it shows that the conflict between the two forces is still active and that the resisting powers of the system are not exhausted.

Another important fact to be borne in mind is that the white cells are not increased by a suppurative inflammation unless its products (*ptomains*) gain entrance into the circulation in sufficient quantities to exert a chemotactic influence upon the leukocytes, and for this reason the blood-findings are generally negative in cases of chronic pus cavities or purulent collections surrounded by firm adhesions.

And, finally, we must also take into consideration the physiologic causes of leukocytosis in order to interpret the blood-findings and estimate their value in an individual case.

BACTERIEMIA.

Definition.—Bacteriemia is the presence of schizomycetes or bacteria in the blood.

Causes.—The affection may develop during the course of a disease as the result of bacterial development upon or within the tissues of the body. Sufficient authentic information is now available to show conclusively that a large number of bacteria have been isolated from the blood and that the recovery of specific micro-organisms has not infrequently been of great diagnostic value in determining the nature of an obscure disease.

The following bacteria which have an important bearing on the diagnosis, prognosis, and treatment of surgical affections have been isolated from the blood:

Streptococcus pyogenes.	Bacillus tetani.
Staphylococcus pyogenes.	Bacillus anthracis.
Gonococcus.	Bacillus mallei.
Pneumococcus.	Bacillus tuberculosis.
Bacillus coli communis.	Bacillus pyocyaneus.

Bacillus aërogenes capsulatus.

Significance.—Positive results from a blood-examination are, of course, conclusive evidence as to the nature of the infection, but unfortunately it is by no means always possible to isolate the micro-organisms, and consequently negative findings have but little or no clinical value. Von Eiselsberg found specific bacteria in the blood from 77 out of 156 cases which he examined.

HEMOGLOBIN PERCENTAGE.

Normal Percentage.—This will be found to be from 85 to 95 per cent. in this climate, while among individuals living in the tropics a slightly higher percentage is often noted, and according to Boston, in robust women a reading of 100 or 110 is not uncommon.

Significance.—The precise value of the percentage of hemoglobin in the blood from a surgical point of view is as yet undecided, and some authorities place but little or no reliance upon such information. Others, again, take a different view of the subject and refuse to operate, except in cases demanding immediate surgical interference, when the hemoglobin is below

30 per cent. Some operators, on the other hand, place 40 or 50 per cent. as the limit of safety, and contend that if this rule is insisted upon the number of deaths from post-operative shock and hemorrhage will be diminished. The clinical evidence, however, does not bear out this extreme view, and probably the wisest course to pursue would be to consider the percentage of hemoglobin in connection with the general condition of the patient, and if both are below normal delay surgical interference if possible until a systematic course of treatment has been given to correct the deficiency.

RAPIDITY OF COAGULATION.

Normal Coagulation Time.—Healthy blood tested by the glass slide method or by Wright's coagulometer coagulates in from two to five minutes.

Significance.—In certain diseases which are associated with a tendency to hemorrhage or capillary oozing a knowledge of the coagulation time of the blood will prove of value is determining upon the question of operative interference and the proper course of treatment to pursue. This is especially true when an operation is contemplated in a patient suffering from jaundice, hemophilia, or purpura, and if under these circumstances coagulation does not take place by the above tests within the normal time, but is delayed for ten or fifteen minutes, then surgical interference should be delayed if possible until the deficiency has been corrected by appropriate treatment, otherwise there is danger of death resulting from capillary oozing.

SPECIAL CONDITIONS.

Hemorrhage.—Numerous observations have demonstrated that traumatic and other forms of hemorrhage are associated with a moderate leukocytosis—15,000 to 25,000—which comes on, as a rule, within from five to ten hours after the accident, although in cases in which there is a large amount of blood lost the leukocyte count may show an increase within the first hour. As a rule, the leukocytosis chiefly involves the polynuclear neutrophiles, but in rare cases a lymphocytosis is present and the differential count shows that the percentages of the other leukocytes have been increased.

There is also a diminution in the number of red cells and in the percentage of hemoglobin; an increase in the blood-plaques; and the coagulation time is more rapid than normal, especially when the hemorrhage has been very severe.

Peritonitis.—As in other infections, all forms of peritonitis, except the tubercular, may be associated with a leukocytosis unless the resistance of the patient is weak and no reaction occurs, in which case leukopenia may be present. A sudden rise in the leukocyte count during the course of an attack of peritonitis indicates an extension of the inflammation. Anemia is not infrequently associated with peritonitis and there is often found to be a decrease in the number of red cells and in the percentage of hemoglobin.

Intestinal Obstruction.—As a rule, there is a rise to at least 20,000 in the leukocyte count in cases of intestinal obstruction within the first twelve or twenty-four hours after the accident occurs. According to some authorities, cases of slight bowel distention due to post-operative intestinal paralysis and associated with gastric irritability do not give a leukocyte count above 12,000 or 15,000, and hence the difference between the grade of the leukocytosis in this condition and that of obstruction is a valuable point in making a differential diagnosis in the first twenty-four or forty-eight hours after an abdominal operation. On the third or fourth day a low leukocytosis (below 10,000) indicates

gangrene at the seat of obstruction, whereas a high count (20,000 to 30,000) shows good resistance upon the part of the patient and a favorable prognosis from an operative standpoint.

Septic Infection.—Hemoglobin and Erythrocytes.—Sooner or later an anemia develops and there is a decrease in the percentage of hemoglobin and the number of erythrocytes. This decrease depends upon the severity and the duration of the infection and is often found to be most marked in chronic appendicular and other long-standing abscesses.

Bacteriemia.—The findings in the majority of cases are negative and the specific micro-organisms are not isolated by the blood-examination. Positive findings are of great value in assisting to determine the nature of an obscure infection, but a sterile culture does not exclude the presence of sepsis nor influence in any way the prognosis of the affection. According to some authorities, the presence in the blood of the Staphylococcus pyogenes albus does not affect the prognosis one way or the other, whereas the condition must always be considered grave if the other pyogenic cocci are found.

Leukocytosis.—An increase in the leukocyte count is a very uncertain symptom in cases of septic infection, and it not infrequently happens that this sign is absent altogether or the number of white cells is decreased below normal. The presence or absence of a leukocytosis depends, as stated elsewhere, upon the resistance of the patient, the severity of the infection, and the absorption of the poisons or toxins, and hence the leukocyte count in many instances is only of value from a diagnostic point of view when considered in connection with other clinical symptoms. The degree of leukocytosis, as a rule, is not high in septicemia, and we may consider from 15,000 to 20,000 as an average count. In cases of simple catarrhal appendicitis there is no leukocytosis present except in rare cases when the leukocyte count may be moderately high. If, however, the appendicular inflammation is complicated by pus, gangrene, or peritonitis, the white cells increase rapidly in number and a high leukocytosis develops unless the resisting powers of the patient are destroyed or the walls of the abscess prevent the toxins from being absorbed.

Diagnosis.—The presence of a localized abscess may be suspected if the leukocyte count is moderately high and there is an excess of fibrin in the blood as well as a positive iodin reaction (the affinity shown by the leukocytes for iodin). On the other hand, however, we cannot exclude pus if all the findings are negative. Positive results from the blood-examination in cases of general septicemia are a valuable assistance in making a diagnosis, but if the leukocytosis is absent the findings are of no value whatever unless specific micro-organisms are shown to be present. The iodin reaction is very constant in septic conditions, especially those of puerperal origin, and the early and rapid decrease in the percentage of hemoglobin and the number of erythrocytes is always suggestive of this form of infection. In *appendicular* inflammations the value of a blood-examination is highly problematical, and but little or no positive information can be obtained, as the findings are identical with those of pus collections in the kidneys, the ovaries, the Fallopian tubes, etc. DaCosta holds in a general way that an "absence of or a slight leukocytosis suggests either (*a*) simple catarrhal appendicitis, (*b*) fulminant appendicitis, or (*c*) a localized pus focus from which no absorption occurs. Well-marked leukocytosis indicates either (*a*) a local abscess from which absorption of toxins occur, (*b*) general peritonitis, or (*c*) gangrene."

Malignant Disease.—A leukocytosis may be associated with carcinoma and sarcoma, although these neoplasms are frequently present without any increase occurring in the number of white cells. The cause of the high leukocyte

count is probably due in most instances to inflammatory conditions occurring in the neighborhood of the growth, yet it seems not unlikely that a positive chemotactic influence may result from the toxins of the tumor itself. The leukocytosis is usually less than 20,000, although it may reach as high as 30,000 or 40,000 in certain cases, and, as a rule, the count is higher in sarcoma than in cancer.

Tuberculosis.—The blood-changes in tuberculosis are varied and most unsatisfactory from a diagnostic standpoint. In rare cases of acute miliary tuberculosis the bacillus has been recovered from the blood, but in the majority of instances the bacteriologic findings are negative. As a rule, leukocytosis is absent in uncomplicated cases of tubercular infection, and when it does occur during the course of the disease it is due to a secondary infection and not to the tuberculous process itself. For this reason genito-urinary tuberculosis is frequently associated with a high count, and it is not uncommon to observe a moderate grade of leukocytosis in tubercular conditions of the uterus, the ovaries, the Fallopian tubes, the bladder, and other organs.

CHAPTER IV.

EXAMINATION OF THE ABDOMEN.

The frequency with which pelvic tumors grow beyond the cavity of the pelvis, and the necessity at times to distinguish between them and abdominal enlargements, render it important for the gynecologist to have a thorough knowledge of the different methods of examining the abdomen. The examiner should also have a clear conception of the topographic anatomy of the abdominal cavity, so that when he has succeeded in tracing the origin of a tumor he may know what organs or portions of organs are located in that position.

To facilitate the study of the location of the abdominal organs the surface of the abdomen is divided into nine regions by four arbitrary lines, two of which are horizontal and two vertical. The upper horizontal line extends across the abdomen at the level of the lowest point on the inferior costal border, and the lower line passes across the anterior superior spines of the ilia. The vertical lines extend directly upward from the middle of Poupart's ligament on either side.

The following, taken from Deaver's "Surgical Anatomy," shows the organs found in each region:

Right Hypochondriac.—Liver (part of right lobe). Gall-bladder (divided by the longitudinal line). Kidney (upper and outer parts). Colon (hepatic flexure and part of ascending colon).

Epigastric.—Liver (left lobe, quadrate, caudate, and Spigelian lobes). Gall-bladder (divided by the longitudinal line). Stomach (pyloric and middle portions with the cardiac and pyloric orifices). Intestine (first, second, and fourth portions, and the termination of the third portion of the duodenum and part of the transverse colon). Pancreas (head and body). Kidneys (upper and inner parts, with sinus and pelvis of the ureters). Suprarenal bodies. Spleen (upper and inner parts).

Left Hypochondriac.—Liver (small portion of left lobe occasionally). Spleen. Pancreas (tail). Kidney (upper and outer parts). Stomach (cardiac end). Colon (splenic flexure and part of descending colon).

Right Lumbar.—Kidney (lower and outer parts). Intestine (ascending colon, part or all of the cecum, and part or all of the vermiform appendix. Some small intestine, mostly ileum).

Umbilical.—Kidneys (lower and inner portion). Ureters. Intestines (lowest part of third portion of duodenum; part of jejunum, ileum, and transverse colon; and, usually, part of the sigmoid flexure). Uterus in pregnancy.

Left Lumbar.—Kidney (lower and outer parts). Intestine (small intestine, mostly jejunum; descending colon and part of the sigmoid flexure).

Right Iliac.—Intestine (small intestine, mostly ileum; sometimes the tip of the cecum and part or all of the vermiform appendix).

Hypogastric.—Intestine (jejunum and ileum of small intestine, and part of the sigmoid flexure). Ureters. Bladder (in children and, when distended, in adults). Uterus in pregnancy.

Left Iliac.—Intestine (small intestine and part of the sigmoid flexure).

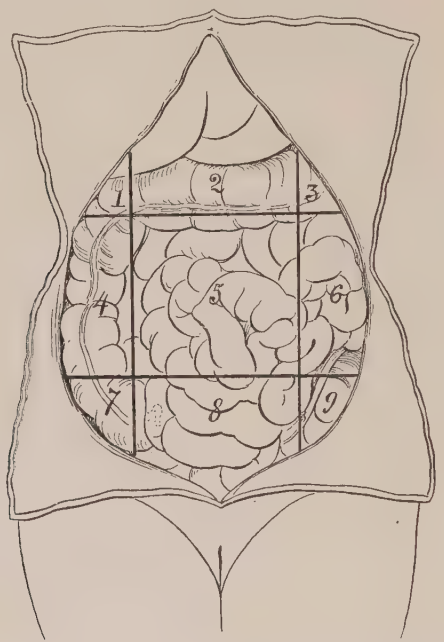


FIG. 69.—DIAGRAM SHOWING THE NINE REGIONS OF THE ABDOMINAL CAVITY.
1, Right hypochondriac; 2, epigastric; 3, left hypochondriac; 4, right lumbar; 5, umbilical; 6, left lumbar; 7, right iliac; 8, hypogastric; 9, left iliac.

Methods.—The abdomen can be examined by the following methods:

Inspection.	Percussion.	Auscultation.
Palpation.	Mensuration.	

Preparation of the Patient.—A purgative dose of citrate of magnesia should be given the night before, followed in the morning by an enema of soap-suds and warm water, and the bladder should be emptied spontaneously just before the examination.

Arrangement of the Clothing and Sheets.—The clothing should be so arranged that the entire abdomen is exposed to view and a sheet thrown over the chest and another over the hips and the lower extremities. If the patient is examined at a private house or a hospital, she should remove all her clothing except the undershirt, night-dress, and stockings.

Position of the Patient.—The position of the patient depends upon the method of examination and will be discussed under separate headings.

Anesthesia.—The use of an anesthetic, as a rule, is not necessary except in cases in which palpation is difficult or unsatisfactory on account of the resistance of the abdominal muscles, overdistention, or tenderness.

INSPECTION.

Position of the Patient.—The patient is placed in the horizontal recumbent position.

Information.—We can elicit the following diagnostic points by means of inspection:

The contour of the abdomen.
The movements of the abdominal walls.
The appearance of the skin.

Technic.—Contour of the Abdomen.—Standing at the side of the patient we note the shape, the size, and the symmetry of the abdomen as well as any irregularities on the surface and the tension or laxity of the walls. We also note whether the umbilicus is depressed or bulging and whether there is

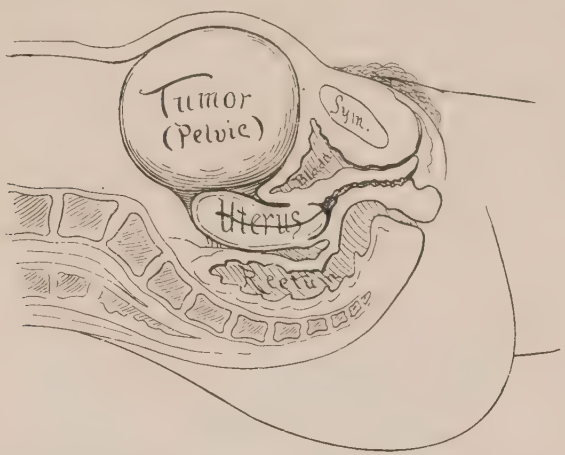


Fig. 70.—Showing the Distention of the Abdomen between the Pubes and Umbilicus Characteristic of a Large Pelvic Tumor.

any evidence of hernia. In fat or relaxed abdominal walls and in cases of ascites the abdomen is flat and the flanks bulge, but when a tumor is present there is a distinct prominence and the appearance of distention is more or less marked.

The surface of the abdomen, as a rule, corresponds to the outlines of the tumor, and if it is lobulated the abdominal wall has an irregular or nodular appearance. The point of greatest prominence on the abdomen usually indicates the region from which the tumor has developed, and if we find that the enlargement is more marked between the pubes and the umbilicus than between the umbilicus and the sternum, it is strong evidence in favor of the pelvic origin of the growth.

The examiner now stands at the feet of the patient and notes whether or not

the abdomen is equally enlarged on both sides. In tumors arising from the ovary or the broad ligament there is always a want of symmetry, in this respect more marked in small than in large tumors, and the distention is invariably greater upon the affected side. In pregnancy and uterine tumors, on the other hand, the abdomen is usually symmetrically enlarged and we do not notice more bulging upon one side than the other.

If the patient is ill in bed we note the position in which she is lying before disturbing her and observe whether she makes any voluntary movements or not. Patients suffering with general or local peritonitis lie very quietly with the knees drawn up to relax the abdominal muscles and relieve the pressure over the inflamed structures.

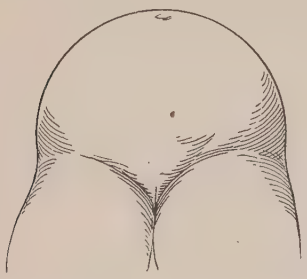


FIG. 71.—SYMMETRIC FORM OF ABDOMEN AS SEEN FROM THE FEET CHARACTERISTIC OF PREGNANCY AND UTERINE TUMORS.

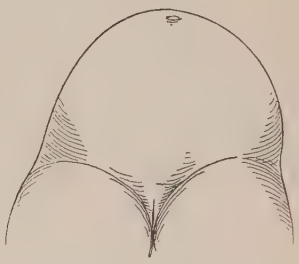


FIG. 72.—ASYMMETRIC FORM OF ABDOMEN AS SEEN FROM THE FEET CHARACTERISTIC OF OVARIAN AND BROAD LIGAMENT TUMORS.

Movements of the Abdominal Walls.—Standing at the side of the patient the movements of the abdominal walls are carefully watched during natural and forced respiration. If no adhesions exist between a tumor and the parietes, the abdominal wall is seen to move smoothly up and down over the enlargement. This is especially noticeable when the surface of a tumor is nodular and the irregularities are seen through the abdominal wall. The act of respiration does not change the position of a tumor which arises from the pelvis.

In some cases we may be able to see the peristaltic wave of the intestine or the pulsations of the abdominal aorta, and if the woman is pregnant to note the situation and force of the fetal movements or the intermittent contractions of the uterus.

Appearance of the Skin.—The surface of the abdomen should be carefully inspected and we should note the presence of skin disease, pigmentations, edema, linea albicantes, or dilated veins. When the abdominal walls are excessively distended, the skin is white and glossy in appearance; and when they are relaxed, they have a shriveled or puckered look.

PALPATION.

Position of the Patient.—The patient is placed on her back with the head and shoulders slightly elevated and the knees drawn up to relax the abdominal muscles and enable the examiner to make deep pressure over the abdomen.

Information.—We can elicit the following diagnostic points by palpation:

The presence of a tumor.

The situation and origin of a tumor.

The shape and mobility of a tumor.
The consistency of a tumor.
Crepitation.
Local tenderness or peritonitis.

Technic.—The Presence of a Tumor.—The presence of a tumor is

Fig. 73.—Recognizing the Presence of a Tumor by Abdominal Palpation.

readily ascertained by pressing the fingers of both hands gently and firmly over the abdomen in all directions. The abdominal walls should move with the

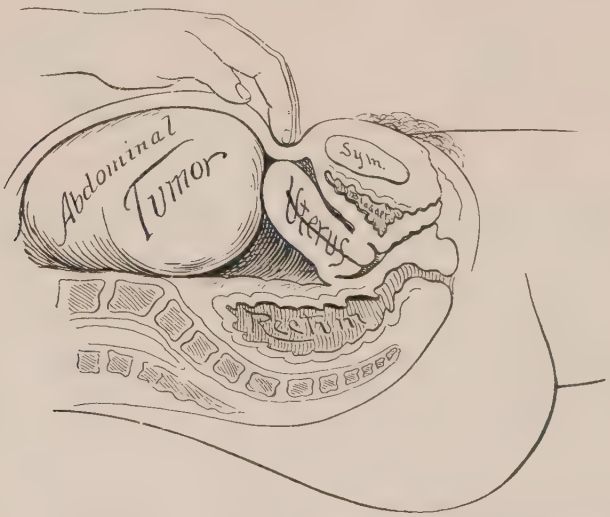


Fig. 74.—Palpating the Lower Border of a Tumor arising from the Abdominal Cavity. Note that the fingers can be passed down between the tumor and the symphysis pubis (page 02).

fingers over the underlying organs and the hands should glide from one area to another until the entire cavity has been palpated.

There is no difficulty, as a rule, in recognizing an abdominal growth if the abdomen is thin and the muscles are relaxed, but sometimes the tumor cannot

be felt by palpation on account of the great amount of fat in the abdominal walls or the small size and the deep situation of the neoplasm.

The Situation and Origin of a Tumor.—Having ascertained the presence of a tumor we must endeavor to trace its outlines and locate its boundaries. The lateral margins and the upper border of a growth arising in the pelvis are recognized without difficulty, and we find that it is situated in the middle of the abdominal cavity, slightly more prominent, however, upon one side than the other. The lower border cannot be felt, as the examining hand comes in contact with the symphysis pubis before the inferior margin of the growth is reached, which proves that the tumor is partly situated within the pelvic cavity. This fact, taken in connection with a marked prominence between the umbilicus and the pubes, is strong confirmatory evidence of the origin of the tumor. On the other hand, a tumor occupying the same position in the abdominal cavity is not

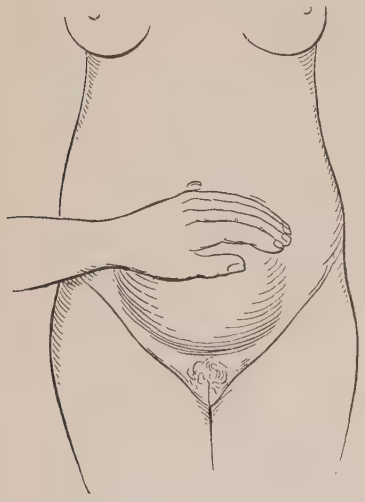


FIG. 75.—MARKING THE UPPER BORDER OF A TUMOR BY THE FAILURE OF RESISTANCE TO THE ULNAR EDGE OF THE HAND.

Note that the ulnar edge of the hand dips deeply into the abdominal cavity at the upper margin of the tumor.

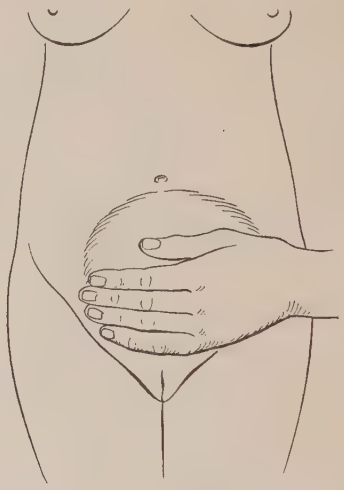


FIG. 76.—SHOWING THE ULNAR EDGE OF THE HAND PASSING DIRECTLY FROM THE LOWER MARGIN OF A PELVIC TUMOR ONTO THE SYMPHYSIS PUBIS.

In the case of a tumor arising from the abdominal cavity the ulnar edge of the hand would dip between its lower border and the symphysis pubis.

likely to be pelvic in origin if its lower border can be recognized at or near the symphysis pubis or the tips of the fingers can be passed between it and the bony rim anteriorly (Fig. 74).

And, finally, a tumor situated in the central part of the abdominal cavity probably arises from that location if its entire circumference can be clearly defined and outlined by palpation.

The boundaries of an abdominal tumor are outlined by placing the palm of the hand upon the most prominent portion of the enlargement with the thumb and fingers slightly flexed and gradually moving the hand upward, downward, and laterally, making strong pressure at the ulnar edge of the hand, so that when the margin of the tumor is reached it can be felt at once by the failure of resistance. Thus, in the case of a pelvic tumor the ulnar edge of the hand will dip deeply into the abdominal cavity at its upper and lateral borders, but when it is

palpated from above downward the resistance continues and the hand passes directly from the tumor onto the symphysis pubis.

The situation and origin of a tumor can also be recognized by palpating the abdomen with two hands by placing them alongside of each other over the most prominent portion of the growth with the fingers and thumbs slightly flexed. The hands are then gradually separated while the tips of the fingers are pressed down upon the tumor in all directions, and when the margins of the growth are reached the resistance ceases and the hands dip deeply into the abdominal cavity.

The Shape and Mobility of a Tumor.—Having located a tumor, its shape is readily ascertained by palpating over its surface and by tracing the outlines of its circumference with the fingers of both hands pressed deeply into the abdominal cavity. By this means we can determine whether the tumor is symmetric in shape and whether its surface is smooth or nodulated.

The mobility of a tumor depends upon the absence or presence of adhesions and its situation. Intestinal or omental adhesions even when extensive cannot be recognized by palpation on account of the length of the mesentery, which allows great latitude of movement. A large tumor filling the abdominal cavity

Fig. 77.—Marking the Lateral Borders of a Tumor by Bimanual Palpation.
Note that the ulnar edges of both hands dip deeply into the abdominal cavity at the sides of the tumor.

is immovable even when it is not adherent to the abdominal wall or the viscera. Small tumors, as a rule, have more or less freedom of motion except when they become incarcerated and fixed within the pelvic cavity. Intraperitoneal tumors usually move up and down during the act of respiration; and the nearer they are situated to the diaphragm, the greater will be these movements. A tumor which arises from the pelvis, however, does not change its position during inspiration and expiration. A parietal tumor moves with the abdominal wall and the fingers of both hands can be passed under it.

The mobility of a tumor can be ascertained by grasping it between the fingers of both hands and testing its range of movement in various directions. This is a more satisfactory method than changing the position of the patient, except when the lower portion of the tumor is impacted in the pelvis and can be freed by placing the patient in the knee-chest position. The movements of a tumor with the act of respiration can be elicited by placing the hand on the surface of the abdomen over the most prominent portion of the growth and noting the changes which take place in its position during natural and forced breathing.

The Consistency of a Tumor.—It is important from the standpoint of diagnosis to determine whether a tumor is solid, fluid, or semisolid, to ascertain its degree of hardness, and to recognize areas of softening. It is very easy to distinguish between a hard and soft tumor, but it is often difficult or impossible to differentiate between a solid growth which is elastic or yielding and one that is cystic in character. The consistency of a tumor is ascertained by palpating it in all directions between the fingers of both hands and by tapping it to determine the absence or presence of fluctuation. The left hand is placed firmly over the abdomen on one side of the tumor and the fingers of the other hand strike or tap the abdominal wall on the opposite side; if fluid is present, a thrill or wave is detected. The fluctuation wave, however, may be absent in multilocular cysts and in tumors having thick, tense walls or viscid contents. The length and intensity of the thrill over different parts of an abdominal enlargement are of great diagnostic value in many instances. Thus, in ascites and unilocular cysts there is no variation in the character of the wave, whereas in a multi-

FIG. 78.—BREAKING THE FAT WAVE IN OBESE WOMEN BY AN ASSISTANT PLACING THE ULNAR EDGE OF HIS HAND OVER THE MEDIAN LINE ON THE ABDOMINAL WALL.

locular tumor it differs as to length and intensity over different parts of the growth. In obese women the fat contained in the belly walls causes a false wave or thrill when the abdomen is tapped which may be mistaken at times for the presence of fluid. To eliminate this factor an assistant places the ulnar edge of his hand firmly on the abdominal wall in the median line while the examiner taps the abdomen in the usual manner.

An intermittent change in the consistency of an abdominal tumor indicates pregnancy, as no enlargement alternately relaxes and contracts with any degree of periodicity except the gravid uterus.

Crepitation.—A grating sensation or crepitus may at times be felt by placing the hand over an abdominal tumor and having the patient take full deep inspirations. This phenomenon may be due to a localized area of peritonitis, to fresh adhesions, or to the displacement of colloid matter within one of the cavities of an ovarian cyst.

Local Tenderness or Peritonitis.—Local or general peritonitis and areas of tenderness are readily determined by palpating over and around the tumor.

PERCUSSION.

Position of the Patient. The patient is first examined in the horizontal recumbent posture and the position is subsequently changed if the examiner suspects the presence of ascites. Thus, she may be placed upon the right or left side and she may sit up or stand erect.

Information.—We can elicit the following diagnostic points by percussion:

The presence of a tumor.
The situation and origin of a tumor.
The shape of a tumor.

Percussion as a means of diagnosis is not so valuable as palpation except to detect slight enlargements of the spleen or liver, to ascertain the presence of gas in a tumor, to demonstrate the relations of the intestines with an abdominal growth, and to distinguish between ascites and a cyst.

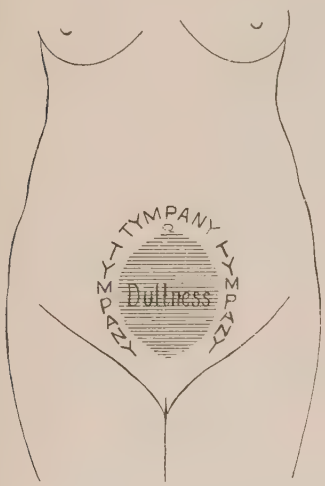


FIG. 79.—SHOWING AREA OF DULLNESS AND TYMPANY IN A TUMOR OF PELVIC ORIGIN EXTENDING INTO THE ABDOMEN (page 66).

Note that the dullness continues below onto the symphysis pubis.

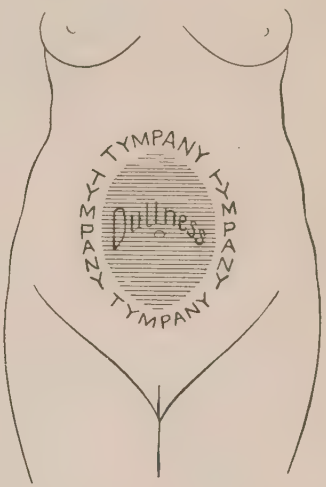


FIG. 80.—SHOWING AREA OF DULLNESS AND TYMPANY IN A TUMOR ARISING FROM THE ABDOMEN (page 66).

Note that the area of dullness is entirely surrounded by tympany and does not continue onto the pubes as in the case of a pelvic tumor.

Technic.—The Presence of a Tumor.—The presence of a tumor is revealed by the percussion-note being dull or flat where tympanitic resonance should normally be heard. It should always be borne in mind that when a tumor contains gas or it is covered by a coil of intestine the percussion-note is tympanitic, and unless the presence of the growth has been previously ascertained by palpation it may be entirely overlooked.

The value of *deep* and *superficial* percussion must be constantly borne in mind in examining the abdomen, otherwise the presence of a tumor may not be detected. Thus, if a growth is covered by intestines it would not be discovered by superficial percussion, as the note would be tympanitic in character, whereas if firm pressure is made upon it the gas would be displaced and dullness elicited. Again, a small tumor or enlarged omentum lying over the intestines can only

be detected by superficial percussion, as intestinal tympany or a resonant note would be brought out by deep percussion.

The Situation and Origin of a Tumor.—The situation and origin of a

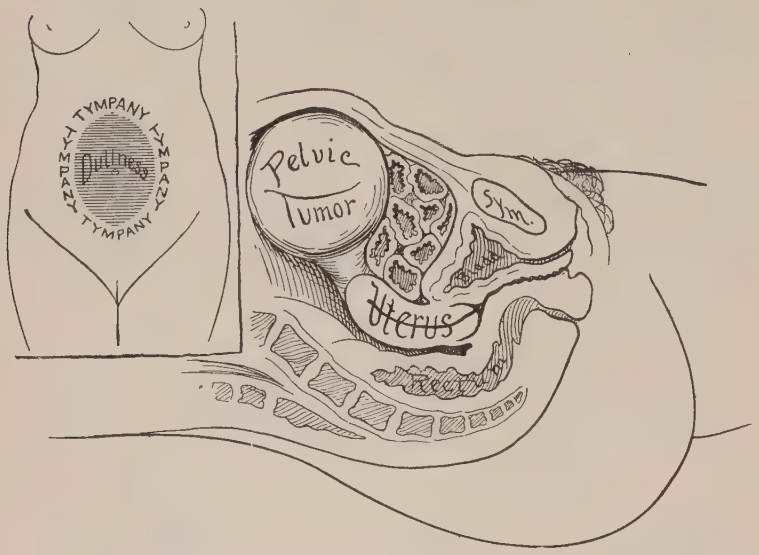


FIG. 81.—SHOWING A PELVIC TUMOR WITH A LONG PEDICLE AND THE INTESTINES INTERPOSED BETWEEN IT AND THE SYMPHYSIS PUBIS.

Note in the upper illustration that there is a central area of dullness entirely surrounded by a ring of resonance, as in the case of an abdominal tumor.

tumor are indicated by dullness on percussion. Directly over a tumor the dullness is absolute, but it gradually shades off into resonance as its margins are reached. A moderate size tumor which arises from the pelvis and occupies the

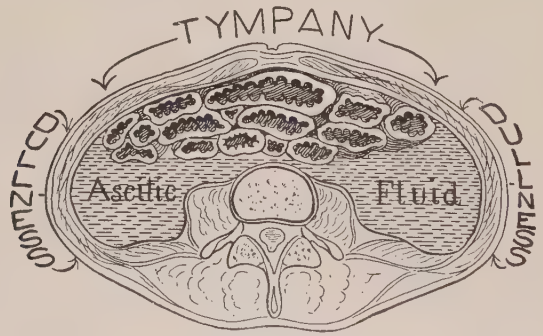


FIG. 82.—SHOWING AREA OF DULLNESS AND TYMPANY IN ASCITES WITH THE PATIENT IN THE HORIZONTAL RECUMBENT POSITION.

Note situation of the ascitic fluid and the position of the intestines.

inferior and middle portion of the abdomen is surrounded by resonance except over its lower part, and here the dullness, which is continuous downward to the pubes, indicates its pelvic origin (Figs. 79 and 80).

Sometimes, however, a tumor with a long pedicle may rise so completely out of the pelvic cavity that intestinal resonance is elicited immediately above the symphysis. In these cases there is a central area of dullness which is surrounded by an uninterrupted zone or ring of resonance and consequently a mistake in the diagnosis can easily be made as to the origin of the tumor if the examiner should rely entirely upon the signs elicited by percussion.

The situation of the areas of dullness and resonance in tumors of pelvic origin is constant and is not affected by a change in the position of the patient. In ascites, on the other hand, these areas change with the position in which the patient is placed.

In the case of a large tumor occupying the whole abdominal cavity and

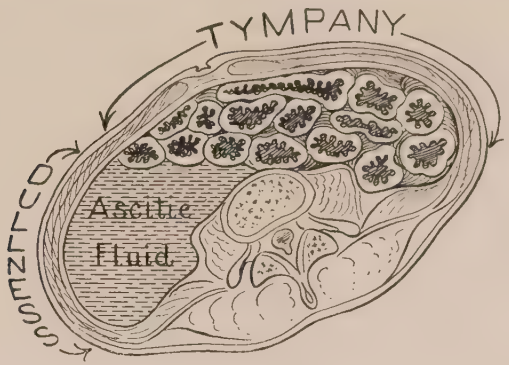


FIG. 83.—SHOWING AREA OF DULLNESS AND TYMPANY IN ASCITES WITH THE PATIENT LYING ON HER SIDE. Compare the change in the situation of the ascitic fluid and the position of the intestines with the previous illustration.

encroaching upon the diaphragm the surrounding area or zone of resonance is absent and there may be dullness not only in the flanks but over the entire abdomen. Sometimes a moderately large tumor may be associated with ascites and the dullness may extend into the flanks. Under these circumstances if the patient is placed upon her side the opposite flank will give a tympanitic note on percussion and thus demonstrate the presence of free fluid in the peritoneal cavity.

The Shape of a Tumor.—The outline of the area of dullness corresponds to the general shape of the tumor. The outlines of a tumor are not altered by placing the patient in different positions. In ascites, however, the opposite condition prevails, and the line of dullness changes with the position of the patient.

MENSURATION.

Position of the Patient.—The patient is placed in the horizontal recumbent position.

Information.—Mensuration often gives us valuable information as to the origin and nature of an enlargement.

Measurements.—These are taken with an ordinary tape-measure as follows:

1. **Between the Ensiform Cartilage and the Anterior Superior Spines of the Ilia.**—These measurements demonstrate the symmetry or asymmetry of the abdomen when it is occupied by a pelvic tumor. The distance between

the cartilage and the ilium is greater on one side than the other in ovarian or broad ligament tumors; it is the same on both sides in pregnancy, uterine growths, and ascites.

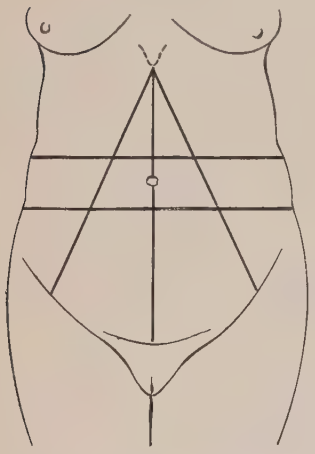


FIG. 84.—MEASUREMENTS OF THE ABDOMEN, TO INDICATE THE NATURE AND ORIGIN OF AN ABDOMINAL ENLARGEMENT.

2. Between the Ensiform Cartilage and the Umbilicus and between the Umbilicus and the Pubes.—These measurements demonstrate the origin of an abdominal enlargement. Thus, if the distance is greater between the umbilicus and the pubes than between the cartilage and the umbilicus, it shows that the tumor has developed either from the lower abdomen or the pelvic cavity.

3. The Greatest Circumference of the Abdomen.—The greatest girth of the abdomen is above the umbilicus in ascites and below it in tumors of pelvic origin.

AUSCULTATION.

Position of the Patient.—The patient is placed in the horizontal recumbent position.

Information.—By means of auscultation we can elicit the following physical signs: The sounds of the fetal heart and the placental circulation; the vascular murmurs in uterine tumors and aneurysms; the friction sounds in peritonitis, and the movement of gas in the intestines.

CHAPTER V.

EXAMINATION OF THE RECTUM.

It is important for the gynecologist to have a practical knowledge of the methods which are employed in making an examination of the rectum, as its anatomic relationship with the vagina and the pelvic organs is so close and intimate that they not only have many lesions in common but we often find the symptoms of a rectal disease referred to the pelvic organs and vice versa.

Methods.—The rectum can be examined by the following methods:

Direct inspection. Vaginal touch. Indirect inspection.
Rectal touch. Probing.

Preparation of the Patient.—In order to make a complete investigation the rectum must be thoroughly emptied and the bladder evacuated spontaneously just before the examination.

DIRECT INSPECTION.

Limitations.—By this method of examination we can inspect the anus and the lower portion of the anterior wall of the rectum for a distance of over an inch. In cases of prolapse the bowel is rolled out when the patient strains or bears down and we can make a direct ocular examination of the extruded portion.

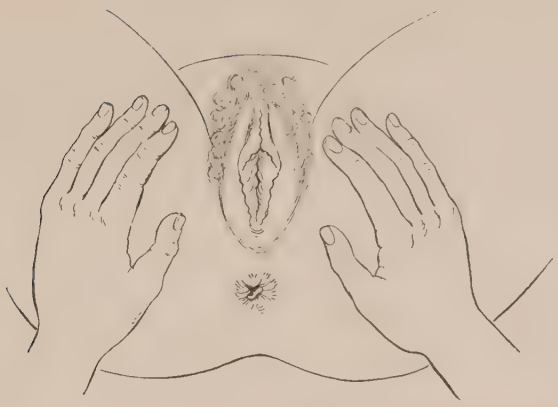


FIG. 85.—EXPOSING THE ANUS BY SEPARATING THE BUTTOCKS (page 70).

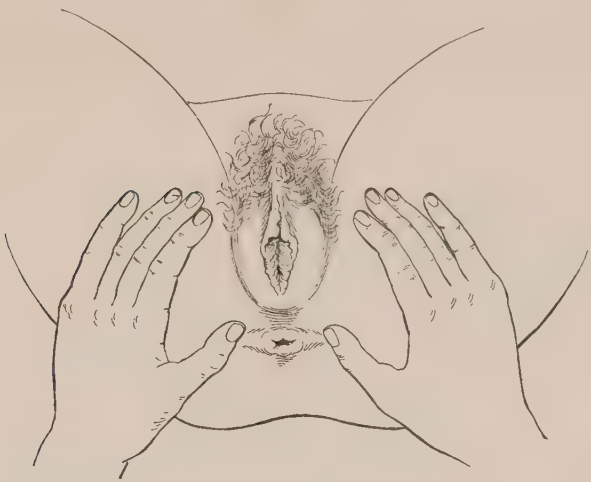


FIG. 86.—EXPOSING THE INNER SURFACE OF THE ANUS BY STRETCHING THE ANAL RING WITH THE THUMBS (page 70).

FIG. 87.—DIGITAL EVERSION OF THE ANTERIOR WALL OF THE RECTUM THROUGH THE VAGINA (page 70).

Position of the Patient.—The patient is placed in the dorsal posture.
Anesthesia.—No anesthetic is required.
Technic.—The examiner sits in front of the vulva, separates the buttocks, and carefully inspects the anus.

The inner surface of the anal ring is then inspected by placing the thumbs on each side of the orifice and drawing it apart, while at the same time the patient increases the eversion of the mucous membrane by straining or bearing down; under these circumstances if a prolapse of the rectum exists the bowel rolls out and is exposed to view.

Another method of inspecting the anal ring and the lower portion of the anterior wall of the rectum is to introduce one or two fingers into the vagina with their palmar surfaces directed downward and push the rectum out through the opening of the anus.

RECTAL TOUCH.

Limitations.—By rectal touch we can examine the anus, the anal canal, and the ampulla of the rectum. The tip of the finger can be carried higher up in the bowel by making strong pressure upward against the anus and the perineum with the knuckles of the examining hand.

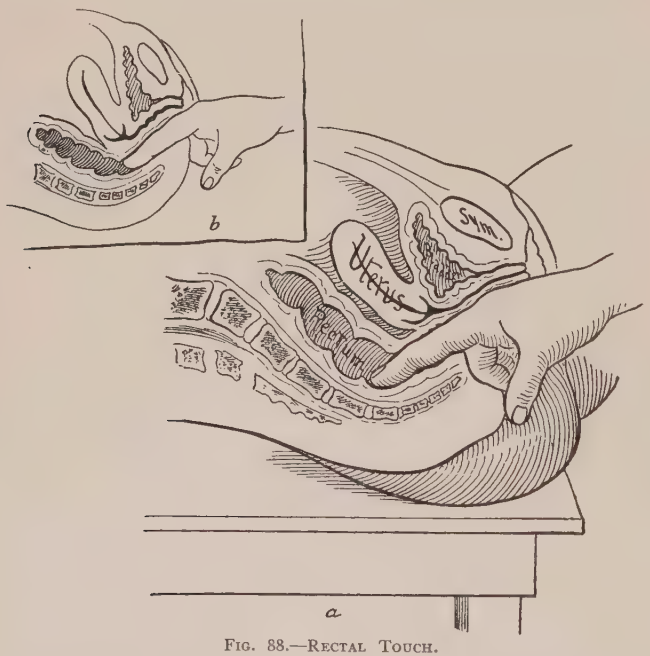


Fig. 88.—Rectal Touch.

Diagram *a* shows the tip of the finger carried high up in the rectum by pressure on the perineum with the knuckles of the examining hand. Diagram *b* shows the position of the tip of the finger when the pelvic floor is not invaginated.

Position of the Patient.—The patient is placed in the dorsal posture.
Anesthesia.—No anesthetic is required.
Technic.—The examiner sits in front of the vulva and palpates the anal opening externally with the tip of the index-finger. The finger is then introduced into the anus as the patient bears down upon it and the anal canal

carefully explored, after which the ampulla of the rectum should be thoroughly palpated.

The size, shape, mobility, and sensitiveness of the rectum as well as the contractility of the sphincter ani muscles can be readily ascertained. In making an examination of the rectum the finger should first pass lightly over the mucous membrane and then the rectal walls are pressed in all directions and rolled between the tip of the finger and the sides of the pelvis.

VAGINAL TOUCH.

Limitations.—The entire course of the rectum can be palpated through the vagina.

Position of the Patient.—The patient is placed in the dorsal posture.

Anesthesia.—No anesthetic is required.

Technic.—The examiner sits in front of the vulva and introduces the

Fig. 89.—Examination of the Rectum by Vaginal Touch.

index-finger into the vagina up to the cervix. The palmar surface of the finger is then turned downward and its tip pressed upward against the third sacral vertebra, at which point the sigmoid flexure ends and the rectum begins (*Deaver*). The entire rectum is then palpated downward as far as the anus by pressing upon the bowel in various directions and by rolling it from one side to the other between the finger and the pelvic walls.

PROBING.

Limitations.—This method of investigation is used to ascertain the direction and situation of an ischiorectal or vaginorectal fistula.

Position of the Patient.—Dorsal posture.

Instruments.—(1) A long slender silver probe; (2) Simon's speculums with flat and curved blades; (3) dressing forceps (Fig. 90).

Cotton Balls.—Small pieces of absorbent cotton should be at hand to remove the secretions from the vagina.

Technic.—The examiner sits in front of the vulva and introduces the index-finger of the left hand into the rectum. A long silver probe is held in the right hand and passed into the external opening of the ischiorectal fistula and

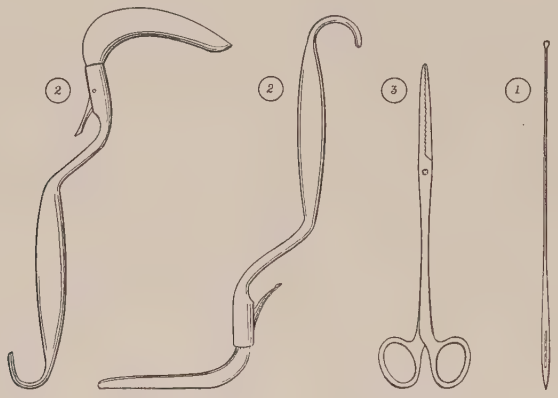


Fig. 90.—Instruments Used in Probing the Rectum (page 71).

carefully pushed along the sinus until its tip enters the lumen of the rectum, where it is at once recognized by the internal finger.

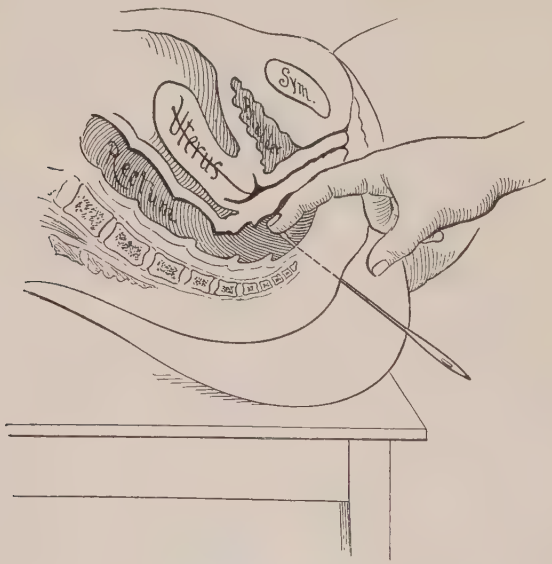


Fig. 91.—Diagnosis of an Ischiorectal Fistula by Means of a Probe.
Note that the tip of the probe is in contact with the finger in the rectum.

In examining a vaginorectal fistula it will be necessary to expose the vaginal opening of the sinus with a speculum if the false passage is situated high up in the vagina.

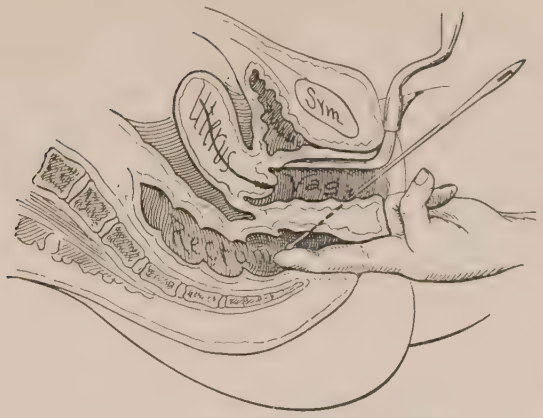


FIG. 92.—DIAGNOSIS OF A VAGINORECTAL FISTULA BY MEANS OF A PROBE.
Note that the vaginal opening of the fistula is exposed by elevating the anterior wall of the vagina with Simon's speculum.

INDIRECT INSPECTION.

Limitations.—The whole mucous surface of the rectum can be investigated by indirect inspection, and by the use of a long tubular speculum the sigmoid flexure can also be exposed to view.

Preparation of the Patient.—The rectum and bladder must be emptied and the corsets removed as well as all constricting bands about the waist.

Position of the Patient.—The knee-chest position is employed.

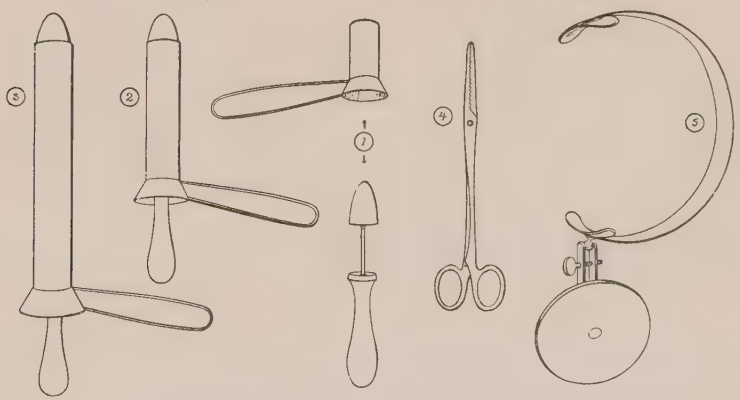


FIG. 93.—INSTRUMENTS USED IN EXAMINING THE RECTUM BY INDIRECT INSPECTION.

The thighs should be perpendicular to the surface of the table and hence the slight squatting position used in cystoscopy must be avoided.

Anesthesia.—An anesthetic is not required unless the patient is nervous or very sensitive to pain.

Instruments.—The following instruments are required: (1) A sphincteroscope; (2) a proctoscope eight inches long; (3) a sigmoidoscope fourteen inches long; (4) dressing forceps; (5) a head mirror.

Each speculum as devised by Kelly consists of a cylindric metal tube having a funnel-shaped expansion at the proximal end, to which a handle is attached, and an obturator, which is used to facilitate the introduction of the instrument.

An electric light or an argand burner gives the best illumination and an ordinary head mirror can be used to reflect the rays into the expanded rectum. Direct illumination with skylight or an electric light will be all that is necessary when the sphincteroscope is used, as the tube is very short and the parts are exposed almost directly to view

Cotton Balls.—Small balls of absorbent cotton should be at hand to remove the secretions from the rectal mucous membrane when they obstruct the view.

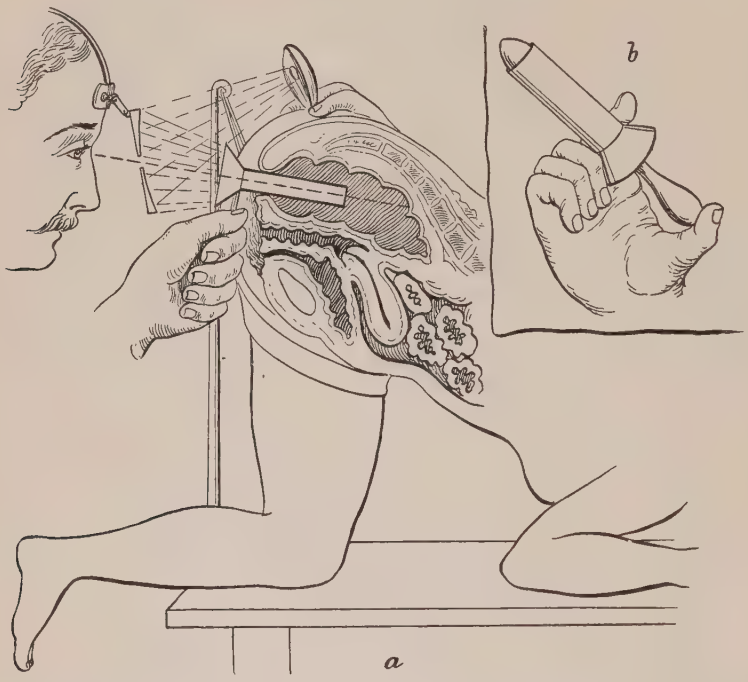


FIG. 94.—INDIRECT INSPECTION OF THE RECTUM.

Diagram *a* shows the pose of the patient and the position of the examiner and the electric light. Note that the thighs are perpendicular to the table. Diagram *b* shows the correct way to hold the proctoscope during the act of introduction.

Technic.—In conducting the examination the sphincteroscope should be used first; then the proctoscope; and finally the sigmoidoscope when an examination of the sigmoid flexure is required.

To facilitate the introduction of the speculum the obturator should be lubricated with liquid white vaselin.

The assistant draws the buttocks apart and exposes the anus. The sphincteroscope is then held in the right hand and the obturator pressed against the anal ring; at the same time the patient is told to strain or bear down. The speculum is now firmly pushed into the bowel until its further progress is checked by the funnel-shaped expansion at the proximal end of the instrument. The obturator is then withdrawn and air at once rushes in and balloons out the rectum. The

anal canal is now examined as follows: Throw the light into the speculum and then gradually withdraw the instrument from the ampulla until the upper edge of the anal canal is exposed to view. After carefully inspecting this portion of the rectum the instrument is now slowly and steadily withdrawn from the bowel and the appearance of the mucosa carefully noted as the sphincter muscles close over the distal opening of the speculum.

The proctoscope and sigmoidoscope are passed into the rectum in the same manner as the sphincteroscope. As soon as the instrument enters the ampulla, which is from one and a half to two inches above the anus, the obturator is withdrawn and the air allowed to rush in and expand the rectum. The light is then thrown into the rectum and the speculum pushed higher and higher up in the bowel, guiding its distal end by sight around the rectal valves and over the folds of the mucous membrane.

CHAPTER VI.

THE X-RAYS IN GYNECOLOGY.

The use of the *x*-rays as a therapeutic remedy is still in an experimental stage, and although some of the results are far from satisfactory or almost *nil*, yet so much has been accomplished in curing certain diseases of an intractable nature that the agent may now be looked upon as an established method of treatment. In a work on gynecology it would be out of place to discuss the technic of using the *x*-rays or to present an analysis of a long series of cases, and I shall therefore limit myself to a general review of the results which have been obtained in the gynecologic department of the Medico-Chirurgical Hospital of Philadelphia by Dr. G. E. Pfahler, director of the *x*-ray laboratory, and the deductions drawn by Pusey and Caldwell in their excellent treatise on the "Röntgen Rays."

Cancer of the Uterus.—A number of inoperable cases of cancer of the uterus have been treated with varying results, and in nearly every instance the patient was made more comfortable. In some of the cases the discharge was lessened in quantity or entirely checked and the odor became less foul. The *x*-rays have a decided effect upon the pain which at times is such a distressing symptom, and in many cases it was greatly relieved or disappeared altogether. In some instances sloughing was prevented, while in others the ulcerative process was checked and the patient saved from the misery attendant upon a fistulous opening in the later stages of the disease. And, finally, in some of the very advanced cases there was no noticeable effect, except perhaps a slight diminution in the severity of the pain.

In advanced cases the *x*-rays offer the only possible hope, and the earlier they are applied the more pronounced will be the relief of symptoms. Before applying the rays as much of the diseased tissues as possible should be removed with the curet and cautery to guard against the occurrence of toxemia or metastasis, which sometimes follows the destruction of a large cancerous mass by the *x*-rays alone.

The rays should always be applied after a hysterectomy for malignant disease, as a possible means of preventing a recurrence, which takes place in about 95 per cent. of all cases operated upon for cancer of the cervix. But little work has been done as yet along these lines, and we will probably find as our experience grows that the rays have a definite influence in preventing the recurrence of cases operated upon early.

Cancer of the Vulva and the Vagina.—Judging from the brilliant results that have been reported by the *x*-ray treatment of superficial cancers in other parts of the body, as well as the beneficial effects already obtained in cases of malignant disease of the external genitalia, it is only fair to presume that this therapeutic method will prove of curative value in primary cancer of the vulva or vagina.

In treating an inoperable case the diseased area should first be thoroughly cureted and cauterized and then exposed to the *x*-rays. It is always best to remove as much as possible of the diseased tissues before using the rays, as it has been demonstrated by experience that the cure is more rapid and certain when this is done. The pain which is usually a prominent symptom of the disease is, as a rule, promptly relieved, but the effect of the rays upon the diseased area is found to vary. In some cases they seem to melt away the cancerous tissue and increase the discharge for a time. In others the discharge lessens within a few weeks, the pain disappears, the growth decreases in size, and the ragged edges of the ulcer become smooth and inverted as healing takes place. The process toward recovery, however, is often very slow, and in some cases a complete cure may take many months.

An operable lesion must first be thoroughly removed by surgical means, and on the following day, if the conditions permit, the *x*-rays should be applied to the seat of operation through the dressings. The treatment should be continued for at least six weeks, and in every instance the rays should subsequently be reapplied at intervals for several years. A radical operation must never be delayed in order to test the effect of the rays, as valuable time may be lost and the case become inoperable. If, however, the growth is first removed and then the original seat of disease exposed to the action of the *x*-rays, the patient is given the benefits of the two best forms of treatment—*complete extirpation and the prophylactic effect of the rays.*

The action of the *x*-rays is especially curative in recurrent cases and they must be used at the first sign of recurrence. If taken early, the induration usually disappears rapidly and a cure results.

The permanency of the cures in cases of superficial cancer by the *x*-rays cannot as yet be determined, but there is every reason to believe that this method will in time be a valuable addition to our resources in the treatment of carcinoma.

Sarcoma.—There have been comparatively few cases of sarcoma treated by the *x*-rays, and their effect upon the disease is therefore not so well known as in cancer. Some remarkable results, however, have been reported, and the treatment should consequently be tried as a prophylactic remedy after the complete removal of a growth, and in inoperable cases, and also when recurrence takes place.

Tuberculosis.—This disease may occur either in the form of lupus vulgaris or a tubercular ulceration involving the vulva or the vagina or both. The use of the *x*-rays is now an established method of treatment in this disease, especially in the former variety, and the results leave no doubt whatever of their efficiency in curing the lesions in many cases. The discharge from the ulcerating surfaces usually disappears quite promptly and the tubercles drop off, leaving a healthy granulating base. Improvement is usually observed at the end of a few weeks' treatment, and in the course of several months the ulcers are healed over.

The results obtained in the treatment of deep-seated tuberculosis in other parts of the body, such as the joints and the spinal column, justify us in hoping that the *x*-rays will prove to be a curative agent in cases of genito-urinary sinuses caused by tubercular disease.

Eczema.—Both acute and chronic eczema have been cured by means of the *x*-rays. They are especially curative, however, in the chronic indurated type of the disease. In both the acute and chronic forms the persistent itching is nearly always relieved after a few exposures; the induration disappears later; and the skin finally assumes a healthy appearance.

The *x*-ray treatment can be combined with general and local medication.

The results of the treatment seem to be permanent in many instances, and cases have been under observation for two years without any recurrence of the disease.

Acne.—The testimony as to the effect of the *x*-ray treatment in acne is practically unanimous, and good results should therefore be expected by applying this method of treatment to the disease when it attacks the vulva. The cure of the affection is usually permanent, and if the eruption does recur it is generally in a modified form which readily yields to a few exposures.

Prurigo.—There have been very few cases of this disease treated with the *x*-rays, and the results so far have been unsatisfactory.

Lichen Planus.—Pusey has reported one case of lichen planus of the scrotum which he cured by the *x*-rays after two months of treatment. The itching was first relieved, then the patches began to fade, and finally all trace of the disease disappeared.

Elephantiasis.—The results obtained by Mascat in the treatment of this disease with the *x*-rays would lead us to expect decided benefit in the treatment of elephantiasis of the vulva.

Pruritus Vulvæ.—The *x*-rays have been utilized in the treatment of pruritus vulvæ and a number of successful cases have been reported. There is a decided effect produced by the *x*-rays in relieving itching, and they should therefore always be given a trial in the treatment of persistent cases of pruritus vulvæ.

CHAPTER VII.

HYDROTHERAPY.

The use of water as an auxiliary in the treatment of diseases of women is too frequently lost sight of or neglected altogether by the profession, and, as a rule, even when hydriatic methods are employed but little or no benefit results. This state of affairs is due to a general ignorance upon the part of the profession of the subject of hydrotherapy and the action of heat and cold when applied to the surface of the body or within its cavities. In order to employ a remedy intelligently we must have a definite knowledge of its action and also a clear conception of the results which may be expected to follow its use; otherwise complete failure or only partial success will be obtained. It is, therefore, absolutely essential for the physician not only to understand the laws of hydrotherapy thoroughly, but to instruct his patients carefully in the technic of the treatment.

The usual method of employing a vaginal douche is a good illustration of the fact that hydriatic treatment is not, as a general rule, scientifically understood. The patient is simply told by her physician to inject a pint or quart of hot water into the vagina once or twice daily, and as a result of such indefinite directions the woman assumes a stooping position over a basin and douches herself with a quart of water of an uncertain temperature. This technic

naturally does but little good, and may result in positive harm if the injections are used for a definite purpose. In discussing later on the action of heat and cold upon the tissues of the body it will become evident that the use of a vaginal douche requires a definite technic based upon certain fundamental laws, and that explicit directions must be given to the patient as to the amount and temperature of the water as well as the position she must assume when using the injection.

Physiologic Action.—The effect produced by water at various temperatures when applied to the surface of the body or within its cavities results in more or less permanent changes in the respiratory and circulatory systems as well as in the rapidity and extent of tissue metamorphosis and in the character and quantity of the excretions and secretions of the body.

This action is due, *first*, to the mechanic contact of the fluid upon the tissues; and, *second*, to the direct impression produced by the temperature of the water upon the blood-vessels and nerves.

To obtain the effects produced by mechanic contact the water must strike the surface of the skin or be injected into the cavities of the body with more or less force; consequently we employ for this purpose the jet-, shower-, or needle-bath, and the vaginal or rectal douche. The force of the water upon the peripheral vasomotor nerves produces immediate stimulation, which is followed sooner or later by relaxation. These impressions are carried to the central nervous system and from there distributed to the respiratory and circulatory centers, producing changes in the act of respiration and in the force of the blood-current which consequently influence tissue changes and modify the character of the excretions and secretions of the body.

The impressions produced by the temperature of the water depend upon the degree of heat or cold and the duration of the application. The effect of a decided temperature is to stimulate the vasomotor nerves, which sooner or later relax again, and, as in the case of mechanic contact, the central nervous system receives the impressions and distributes them to the different centers. Furthermore, stimulation of the vasomotor nerves causes contraction of the blood-vessels, which is followed in a variable length of time by relaxation. Hence while the vessels are contracted the blood leaves the part and the vascular tension is increased, and, as a result, the activity of the organs of the body is more or less modified. And, finally, when heat or cold is applied to muscular fibers they undergo contraction, followed eventually by relaxation. Consequently, the narrowing of the blood-vessels which occurs is not only due to the vasomotor stimulation but also to the direct influence of the temperature reaction upon the muscular fibers in the walls of the arteries and the veins.

The degree of heat or cold determines the rapidity with which the vessels contract, and the duration of the application governs the length of the period of stimulation. Thus, a temperature of 110° F. produces quicker results than one of 90°, while an application lasting twenty minutes will result in a longer period of stimulation than one of only half the time. Sooner or later, however, stimulation is followed by relaxation, which is also spoken of as *reaction*. During this period the blood-vessels dilate again, the extremities become warm, the skin is more or less flushed, and the patient experiences a feeling of general comfort and vigor. It is evident, therefore, that we are always able to lengthen or shorten the period of stimulation by the temperature and duration of the application, and upon this fact depends success or failure in the hydriatic treatment of disease. Furthermore, as the activity of the internal organs is controlled by the amount of blood they contain, and as the

cutaneous vessels are able to hold over 60 per cent. of the total quantity in the body, it naturally follows that the distribution of the blood can always be more or less controlled by the application of heat or cold to the skin.

Moderate degrees of heat or cold produce relaxation of the vasomotor nerves and the muscular system, and consequently the blood-vessels are dilated and the impressions conveyed to the central nervous system are sedative and not stimulating in character.

General Effect of Cold.—We make use of cold applications principally to bring about *reaction*, and unless this occurs quickly and decidedly depression results and the vital powers of the patient are lowered.

The effect of cold upon the respiration causes a deepening of the respiratory act and a greater supply of air is consequently taken into the lungs, thereby increasing the oxygen in the blood, and the elimination of carbonic acid. The heart is also stimulated and the vascular tension is increased. As a result of these conditions the tissue changes are augmented, more urea is excreted, the urine is increased in amount, and the patient's health and appetite are improved.

The daily stimulation and relaxation of the peripheral vasomotor nerves by the application of cold water cause contraction and subsequent dilatation of the cutaneous blood-vessels, harden the skin, strengthen the general system, and accustom the surface of the body to temperature changes, and as a result the patient's power of resisting morbid influences is greatly increased.

In using cold as a therapeutic agent we must not confound the stimulation of the vasomotor nerves with the stimulating effects produced upon the general system by the reaction. While the former condition lasts the patient is always more or less shocked, and if reaction is delayed depression of the vital powers ensues. Consequently stimulation of the vasomotor nerves must give place to relaxation before the invigorating and stimulating effects of the application are experienced by the patient. Therefore in speaking of the stimulating effect of cold upon the peripheral nerve-endings we do not mean that the general system is necessarily invigorated, because, as we have already seen, a continuous application is depressing in its results.

The promptness of reaction depends upon the degree of cold, the duration of the application, the subsequent use of friction and exercise, and the natural ability of the patient to recover from the shock. Reaction is always delayed or is imperfect in some women even when graduated baths are used to accustom the surface of the body to a comparatively low temperature, but, as a rule, most of these patients can be made to react promptly by careful attention to the technic of the treatment.

When cold is applied to the surface the heat of the body is more or less reduced, but along with the subsequent reaction the heat-centers are stimulated, so that the final effect is to increase the temperature. This fact is shown by the results of a cold plunge in warm weather, which first cools the body, but later when reaction takes place the temperature is increased and free perspiration occurs. If, however, the immersion is continued for ten to fifteen minutes, the period of vasomotor stimulation is indefinitely prolonged and the depression which results keeps the temperature reduced; the reaction being imperfect or greatly delayed. A prolonged immersion of the body in cold water is always injurious, as the patient becomes temporarily depressed and debilitated and frequently suffers with slight nausea and a feeling of weight over the epigastric region.

General Effect of Heat.—We make use of heat chiefly to produce a sedative action. A hot bath causes a feeling of general relaxation and a

tendency to sleep. Its excessive use is debilitating and relaxes the system, exposing the patient to the danger of catching cold if she subjects herself subsequently to a sudden change of temperature.

The effect of heat upon the nervous and circulatory systems is sedative; it lessens reflex irritability; soothes the patient; and diminishes mental activity. Its application is without shock and it produces a relaxing effect upon the vasomotor nerves, which is followed by dilatation of the capillary blood-vessels of the skin and the withdrawal of the blood from the internal organs to the surface of the body. The application of a very high temperature, however, is stimulating to the vasomotor nerves and the muscular coat of the arteries and the veins. The prolonged application of heat has the same result, so that practically the *primary effect* of a high temperature is relaxing, and more blood is brought to the part, while the *secondary action* is stimulating and drives the blood out of the tissues.

The prolonged application of heat is followed by free perspiration, which eliminates the toxins in the blood and increases tissue changes.

Importance of the Technic.—No beneficial results can be expected to follow the use of hydropathic agents if the treatment is applied in a haphazard or a careless manner. All the details of the technic must be clearly and thoroughly arranged and the patient given minute instructions in writing.

The following practical points should be noted:

The time of day the treatment is taken.
The method employed.
The position of the patient.
The temperature and quantity of the water.
The duration of the bath or the douche.
The special form of friction or exercise used to assist reaction.
The length of time subsequently devoted to rest.
The temperature of the bath-room.

The Time of Day the Treatment is Taken.—Sedative baths, as a rule, should be taken at night before retiring or in the afternoon. Stimulating baths, on the other hand, are usually most beneficial when taken in the morning immediately after getting out of bed. Vaginal douches, whether used for therapeutic purposes or for reasons of cleanliness, are more conveniently taken the first thing in the morning or at bedtime than during any other part of the day. The time of day the treatment is taken, however, will often depend upon the peculiarities of the patient, the state of her general health and strength, and also upon her environment. Every patient is therefore a law unto herself, and a careful study of the indications must be made with the view of selecting the best and most convenient time for treatment.

The Method Employed.—The indications for treatment, the financial ability of the patient to carry out the instructions, and any existing idiosyncrasy relative to the effect of mechanical contact upon the respiratory and circulatory centers must be carefully considered before selecting the method. Some women react quickly after a cold plunge, while others are only able to stand the shock of a rapid sponging; or, again, a shower-bath will act as a stimulant or a depressant according to the resisting powers of the patient at the time. A little ingenuity upon the part of the attending physician will often enable him to substitute a cheap home-made apparatus for the more elaborate needle- or shower-baths when the mechanic contact of water is indicated in the treatment of a woman who is in moderate circumstances. As a matter of fact, the adjustable jet- and shower-baths which are now commonly

sold in the shops are nearly as efficacious as the more expensive permanent attachments found in the houses of the wealthy. (Figs. 97, 98, and 99.)

The Position of the Patient.—The position of the patient depends upon the method employed and upon the therapeutic indications. Thus, some forms of treatment require the erect or standing position, while in others the patient should lie flat upon her back. When a vaginal douche is used for purposes of cleanliness, the patient may stoop over a basin while giving herself the injection, but when it is employed to relieve uterine or pelvic congestion or to treat diseases of the vagina she must assume the dorsal position; otherwise the irrigating fluid will not come in contact with the affected parts.

The Temperature and Quantity of the Water.—The temperature of the water is one of the most important factors in the hydriatic treatment of disease, and consequently too much care or attention cannot be given to this subject. Ignorance of the laws governing the physiologic action of heat or cold upon the tissues of the body or neglecting to apply them intelligently with a view to meet the indications in individual cases is the great cause of failure in the use of hydropathic remedies. We must decide in every case whether a quick or a slow stimulation is required; whether relaxation is indicated; or whether a sedative action is called for. We must also remember that intense cold or heat produces rapid stimulation of the vasomotor nerves and contraction of the muscular fibers in the walls of the arteries and veins, and that consequently when heat is used to control a condition like postpartum hemorrhage the temperature of the water must be high, as a quick or decided action is required. If, however, a low temperature is used, the stimulation is correspondingly slow, and as a result valuable time is lost in checking the hemorrhage. Decided degrees of heat and cold are stimulating, while moderate temperatures are sedative in their action upon the peripheral nerve-endings and in their effect upon the central nervous system.

Fig. 95.—Bath Thermometer.

The temperature of the water must always be taken with a thermometer, otherwise the action of the heat or cold cannot be correctly regulated and consequently no beneficial results will follow. An ordinary bath thermometer should be employed and the patient instructed how to use it.

The quantity of water used in a rectal or vaginal douche is a matter of great importance. A small quantity of water means a short application, and hence when the injections are used to overcome congestion they do harm rather than good, for the reason that reaction occurs quickly and the vessels become engorged with blood. If, however, a large quantity is employed, the period of stimulation or contraction of the blood-vessels and the muscular tissues is prolonged and the subsequent relaxation or reaction is not so marked. Therefore a large quantity of water is always stimulating provided a considerable length of time is consumed in its application; but a small amount, on the other hand, is more or less sedative, as the reaction is prompt and decided.

The Duration of the Bath or the Douche.—The duration of the application determines the period of stimulation and reaction. A brief application of cold in the form of a plunge, a jet- or shower-bath, or a quick sponging is stimulating in its action upon the general system, because the reaction is rapid

and there is no subsequent shock. But a prolonged application is depressing, as the reaction is delayed, and in the meantime the patient is chilled and her vital powers are lowered. In the local application of heat or cold for the relief of congestion or inflammation we take advantage of the fact that a prolonged application produces a protracted period of stimulation followed by only a partial relaxation or reaction. For this reason the vaginal douche should always be used continuously for fifteen to twenty minutes at a time, otherwise the congestion is increased. Again, the effect produced by the long-continued application of a poultice or a fomentation is a good example of the permanent constriction that occurs in the blood-vessels of the affected part under the circumstances.

The Special Form of Friction or Exercise Used to Assist Reaction.—Reaction must occur quickly after the application of cold water to the surface of the body or depression will result and the treatment must be discontinued. Vigorous friction of the skin followed by exercise will be found of great service in assisting reaction, and every patient should be carefully instructed by her physician as to the proper methods to be employed. By neglecting these simple means of bringing about reaction many women are unable to take advantage of the great benefit that is nearly always derived from the use of cold stimulating baths. Friction and exercise are also of service to women who do not need artificial means to bring about reaction, as they stimulate the lungs and heart and thus act as important auxiliaries in the treatment. Sedative baths and local applications should not, as a rule, be followed by friction and exercise.

The Length of Time Subsequently Devoted to Rest.—Rest is an important element in the treatment and its indications should be carefully studied in every case. The health and strength of the patient should be considered, her idiosyncrasies noted, and the effect of the treatment upon her vitality watched. Some women require more rest than others, while those who are strong and robust often feel better when they do not lie down at all after a bath or a douche. Sedative baths should always be followed by a more or less prolonged period of rest, and for this reason they are usually taken at bedtime, when the patient can have several hours of undisturbed sleep.

The Temperature of the Bath-room.—The temperature of the bath-room should be between 65° and 75° F. A lower temperature is likely to chill the patient after a warm bath, while over 75° is too enervating.

Temperatures.—In order that we may have a definite idea of the different temperatures employed in the hydriatic treatment of gynecologic diseases I shall use the following classification when discussing the various methods:

Cold = from 50° to 75° F.
Tepid = from 75° to 95° F.
Warm = from 95° to 104° F.
Hot = from 104° to 114° F.

Methods.—It is always more or less difficult to present the practical side of a subject like hydrotherapy in a simple and concise form, but unless this is accomplished the details and methods are so scattered that it is impossible to get a clear conception of the treatment, and consequently the general practitioner is left with his mind full of badly arranged facts that are utterly useless to him when he attempts to apply his knowledge at the bedside. In order, therefore, to simplify the classification I shall discuss the technic of the different methods under separate headings, as follows:

The full bath.
The half bath.
The sponge bath
The spray bath.
The sitz-bath.
The Turkish bath.

The Russian bath.
The sheet bath.
The salt bath.
Sea bathing.
The vaginal douche.
The intrauterine douche.
Ice-bag; Hot-water bag; Compresses.
Water-drinking.

THE FULL BATH.

The full bath may be taken *cold*, *tepid*, *warm*, or *hot*. The bath-tub is filled with sufficient water to immerse the patient's body completely when she lies down in it.

The Cold Bath.—The cold bath should be taken in the morning on getting out of bed and after exercising for five to ten minutes. Preliminary exercises are very important factors, as they stimulate the respiratory and circulatory centers and thus increase the vascular tension. Hence the patient's power of resistance is increased and she reacts more promptly and with greater vigor after the plunge. Many women who are unable to stand the slightest application of cold under ordinary circumstances have no difficulty whatever in reacting after a plunge in moderately cold water (65° to 75° F.) provided they first exercise for a few minutes. The exercises which I recommend are the various movements described on page 119.

The temperature of a cold bath should be from 50° to 75° F. The woman steps quickly into the tub, immerses her body, and remains in the water from ten to fifteen seconds unless she is very vigorous, in which case the immersion may be continued for one or two minutes. After getting out of the bath the skin is quickly dried with a coarse towel, using strong friction, and the clothing promptly put on. If the reaction is delayed, a few minutes devoted to exercise will generally bring the blood quickly to the surface of the body.

When the temperature of a bath is very cold (50° F. and below), it should always be taken as a quick plunge, otherwise the shock will be too great.

The bath is tonic in its action.

The Tepid Bath.—This bath should be taken in the morning on getting out of bed and after exercising, as in the case of a cold plunge. The temperature of the water should be between 75° and 95° F. The duration of the immersion should be from two to five minutes and the patient should dry her skin by friction with a coarse towel.

The bath is slightly tonic in its effects, but if its application is prolonged it becomes depressing in character.

The Warm Bath.—The warm bath should be taken at bedtime and not preceded by exercise. The temperature of the water should be between 95° and 104° F. The duration of the immersion should be from five to fifteen minutes or longer according to the effects desired.

The bath is sedative in its action; a prolonged application causes general relaxation of the system.

The Hot Bath.—The bath should be taken at bedtime and not preceded by exercise. The temperature of the water should be between 104° and 114° F. and the duration of the immersion should be from five to fifteen minutes or longer according to the effects desired. The skin should be dried without friction by a soft towel.

The bath is very sedative in its action; a prolonged application causes general relaxation and debility.

THE HALF BATH.

The bath should be taken in the afternoon, so that the patient may have an opportunity to rest before dinner or supper as the case may be. Preliminary exercises are not indicated. The tub is partly filled with water so that when the patient lies down in it only half of the body is covered. The temperature of the bath should be between 65° and 80° F. After the patient lies down in the tub she places a towel wrung out of cold water (45° F.) on her head and vigorously rubs the exposed portion of her body, especially over the chest and abdomen,

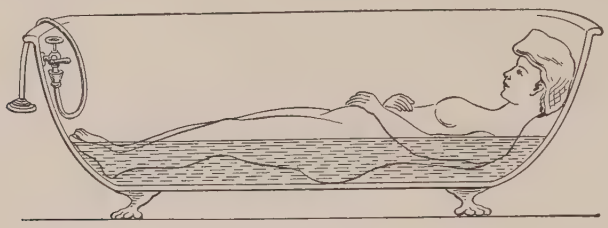


Fig. 96.—Half Bath.

dipping her hands in the water from time to time. If the patient can afford it, a nurse should do the rubbing. The bath should last from five to twenty minutes. The patient then sits up in the tub and douches her shoulders and spine with cold water (50° F.), using for the purpose a sponge or an adjustable spray. The douching, which should only last about half a minute, is followed by vigorous friction with a coarse towel, after which the patient should put on a woolen wrapper and lie down for half an hour before dressing.

The action of the bath is tonic.

THE SPONGE BATH.

The bath may be given as follows:

Cold.	Alternating.
Graduated.	Sponging in bed.

Action.—Stimulating and tonic.

Cold.—The bath should be given in the morning on getting out of bed and after exercising. The patient stands in an empty tub and quickly sponges her body with water at 50° to 75° F. The sponging should not last longer than a minute to a minute and a half and it must be followed by vigorous friction with a coarse towel.

Graduated.—To gradually accustom the body to the shock of cold water Baruch advises "standing in 12 inches of water at 100° F., and resorting to a rapid sponge bath of 80° F. This is reduced daily 2°, until a temperature is reached below 50° F."

Alternating.—The bath should be given in the morning on getting out of bed and should be preceded by exercise. Two large basins are placed on chairs alongside of the tub; one is filled with water at 50° to 75° F., and the other at 104° to 114° F., and a good-sized sponge put in each. The patient now stands in the tub and sponges her body, alternating with the cold and the hot water, until both of the basins are empty. She then dries her body by vigorous friction with a coarse towel.

Sponging in Bed.—A rubber sheet is placed under the patient, her clothing is removed and a woolen blanket is thrown over her body. A basin containing equal parts of alcohol and tepid water (75° to 95° F.) is then placed on a chair or a table alongside of the bed. The nurse now rapidly sponges the anterior and posterior surfaces of the body, including the face, the neck, and the upper and lower extremities. The skin is then dried with a soft towel and the clothing replaced.

The sponge should be dipped frequently in the basin and not squeezed too dry, as it is necessary, in order to get the full benefit of the bath, to apply plenty of water to the patient's skin. The patient must be well protected by the blanket during the bath and only a small portion of the body should be exposed at a time; otherwise there is danger of catching cold.

THE SPRAY BATH.

This form of bath requires an apparatus which throws the water in fine, divided streams, either laterally or vertically against the body.

Permanent shower or needle baths are found in the houses of the wealthy and in regular hydriatic establishments, but for people of moderate means who cannot afford the luxury of expensive plumbing the adjustable connections which are now commonly sold in the shops answer every purpose.

The adjustable spray may be attached to the nozzle of any bath-tub spigot; if the plumbing is arranged with a mixer for the hot and cold water, the single

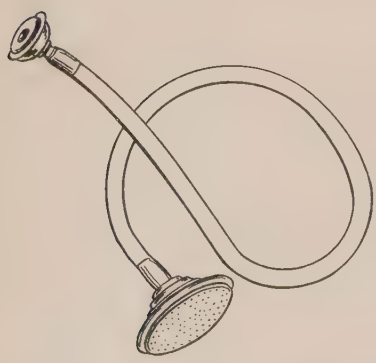


FIG. 97.—ADJUSTABLE SPRAY WITH SINGLE ATTACHMENT.

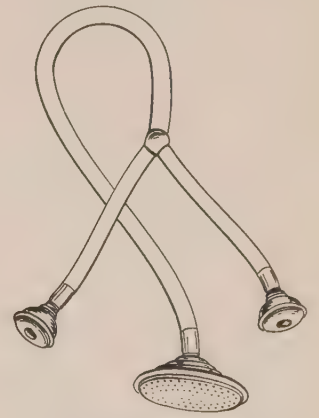


FIG. 98.—ADJUSTABLE SPRAY WITH DOUBLE ATTACHMENT.

hose is employed, but if there are separate spigots the double attachment is required in order to regulate the temperature.

The adjustable shower-bath with a rubber sheet attachment is an inexpensive and a very efficient apparatus to use when an overhead douche or spray is indicated.

In houses which have no running water or bath-tubs a very serviceable apparatus may be made by attaching a sprinkler to a large fountain syringe. After filling the rubber bag with water at the proper temperature it is suspended upon a hook or nail and the patient then stands in an ordinary wooden wash-tub and directs the spray against her body.

In using the spray bath it is important that the force and temperature of the water should be properly regulated. When running water is available, the pressure is easily regulated by the faucets, and when a sprinkler is attached to a fountain syringe it is readily adjusted by the height of the rubber bag from the floor. If a strong pressure of water is required, the patient should not allow the douche to strike her head.

The spray bath may be given as follows:

Cold.	Alternating.
Graduated.	The Scotch douche.

Action.—Stimulating and tonic.

Cold.—The bath should be taken in the morning on getting out of bed after exercising. The water should be at 50° to 75° F. The temperature is

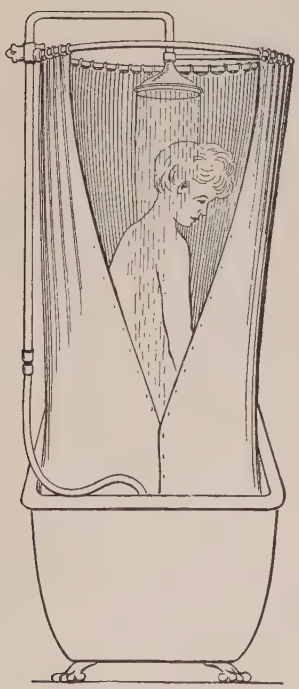


FIG. 99.—ADJUSTABLE SHOWER-BATH WITH A RUBBER SHEET ATTACHMENT (page 85).

FIG. 100.—METHOD OF USING A FOUNTAIN SYRINGE AND SPRINKLER AS A SUBSTITUTE FOR A SPRAY BATH IN THE ABSENCE OF RUNNING WATER (page 85).

regulated by the faucets and tested either by holding the thermometer under the shower or spray or by collecting some of the water in a basin. If a sprinkler is attached to the nozzle of a fountain syringe, the water is mixed in a large pitcher before filling the rubber bag. After getting the water at a proper temperature the patient steps into the tub under the shower and allows the water to strike different parts of the body; first the shoulders, and then the back, the chest, the abdomen, and the upper and lower extremities are exposed to the douche. If a needle bath is used, the patient stands erect while the jets of water strike her body. When an adjustable spray is employed, the sprinkler is held in the

right hand and the stream of water directed first over the shoulders and then over the back, the chest, the abdomen, and the upper and lower extremities.

The duration of the bath should not exceed, as a rule, more than from ten to thirty seconds; occasionally, however, it may be continued for two or three minutes. The bath must be followed by vigorous friction with a coarse towel.

Graduated.—The technic of the bath is the same as when cold water is used, except that the temperature of the shower or spray should be 80° F. This is reduced one or two degrees each morning until eventually the douche is given at 50° F. or below.

Alternating.—The bath is given in the morning immediately after getting out of bed and should be preceded by exercise. A permanent needle or shower-bath or hot and cold water spigots to which an adjustable spray may be attached are required for the alternating douche. The water should first be hot (104° to 114° F.) and then abruptly changed to cold (50° to 75° F.). The hot douche should continue for one or two minutes and the cold not longer than fifteen to thirty seconds. The bath may also be given by rapidly alternating between hot and cold for one or two minutes, or, again, the patient may resist the sudden changes of temperature better by standing in a foot of water at 100° F. The bath must be followed by vigorous friction with a coarse towel.

The Scotch Douche.—This douche is "a shower-bath, in which the temperature, at the beginning, is about 86° F., and is gradually raised to 122° F., which is about as hot as can be borne; this is followed immediately by a douche about as cold as ice. The duration of the douche should be very brief (ten to twenty seconds), and should be preceded by active exercise." (Dr. John V. Shoemaker.)

The bath should be followed by vigorous friction with a coarse towel. The best time to take the douche is in the morning on getting up, or late in the afternoon.

THE SITZ-BATH.

A special form of tub which is usually made of zinc or tin is required. The water should reach as high as the umbilicus and the patient should be protected from cold by having a light woolen blanket thrown around her.

The bath may be given as follows:

Cold, Hot, Graduated.

Action.—A cold sitz-bath is stimulating to the pelvic and abdominal organs; a hot bath is sedative.

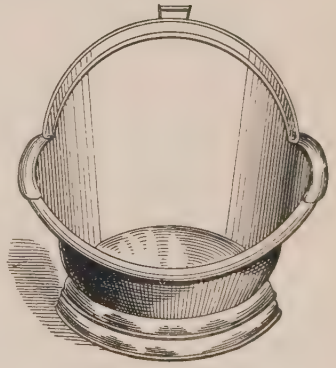


FIG. 101.—SITZ-BATH TUB MADE OF TIN.

Cold.—The bath should not be preceded by exercise and is taken in the afternoon unless there are special therapeutic reasons for taking it at some other time. The water must be from 50° to 75° F. and the duration of the bath should be from ten to thirty minutes. The patient should be quickly dried afterward and allowed to rest for half an hour before dressing.

Hot.—The bath should not be preceded by exercise and is usually taken at bedtime. The water must be from 104° to 114° F., and the duration of the bath should be from twenty to thirty minutes. The patient is then quickly dried and placed in bed.

Graduated.—The bath should not be preceded by exercise and is taken, as a rule, at bedtime. The temperature of the water in the beginning must be

100° F., and the patient then gradually adds water at 50° F. until she begins to feel chilly, which is usually in about ten or fifteen minutes, when she is quickly dried and placed in bed.

THE TURKISH BATH.

The hot-air or Turkish bath may be taken at a regular bathing establishment or at home.

Action.—The bath eliminates waste products and toxic substances from the system and increases tissue changes.

Technic.—The method of giving a Turkish bath at a regular bathing establishment need not be discussed here, as the attendants always carefully instruct those visiting these places for the first time.

In order to take a Turkish bath at home a specially constructed apparatus or cabinet is required. These cabinets are made of many different materials and designs, but they are all essentially built upon the same principle. Some of the cabinets on the market are, however, more simple in their construction than others, and are consequently better adapted for general use. Figure 103 represents a square cabinet which is very durable and serviceable. It is made of a steel frame with a double covering of rubber sheeting, and when not in use it may be folded up and placed out of the way. An alcohol lamp which comes with the cabinet supplies the heat. The lamp, however, is very inconvenient to use, and sometimes dangerous, and a small round gas stove, which can be bought in the shops for 25 cents, should be used in place of it.

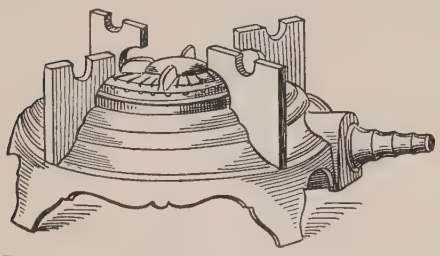


Fig. 102.—Round Gas Stove for Heating a Turkish Bath Cabinet.

My method of arranging the interior of the cabinet is as follows:

1. A wooden kitchen chair with the back sawed off is placed on the floor in the center of the cabinet.

2. A round asbestos pad is placed on the floor immediately under the chair.

3. The gas stove, which is connected by rubber tubing with a gas burner, is placed upon the pad, while another round asbestos pad rests upon the top of the stove.

4. A folded bath towel is placed on the chair and also on the floor for the feet to rest upon.

The amount of heat required can be readily regulated when a gas stove is used, and there is also no danger of an accident from fire, which is not the case if an alcohol lamp is employed.

The bath should be taken in the afternoon about 5 o'clock or at bedtime. It may or may not be preceded by exercise.

The technic is divided into the following steps: (1) Heat the cabinet for ten minutes before getting into it. (2) Before entering the cabinet drink one or two glasses of distilled water. (3) Remain in the cabinet, as a rule, for fifteen or twenty minutes and place a towel around the neck to prevent the escape of hot air through the opening in the top of the apparatus. (4) Immediately after getting out take a hot shower, needle, or spray bath (104° to 114° F.) lasting one minute and then rapidly douche the body with cold water (50° to 75° F.). (5) Dry the skin with a coarse towel; drink one or two glasses of distilled water; and either rest for half an hour or go to bed for the night.

Usually the body begins to perspire in about five minutes after entering the cabinet; the face in ten minutes; and from that time on the perspiration becomes general and profuse. The duration of the bath varies in individual cases, as some women require a longer time than others to produce free perspiration. When the vascular tension is increased sufficiently to cause a feeling of fullness

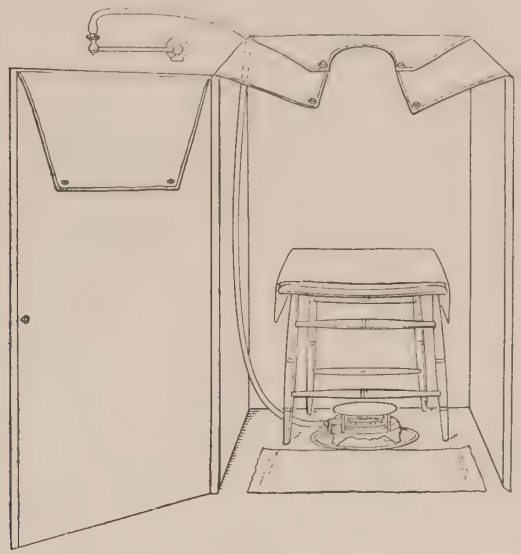


FIG. 103.—THE AUTHOR'S METHOD OF ARRANGING THE INTERIOR OF A TURKISH BATH CABINET.

or throbbing in the head, the patient should get out of the cabinet at once; a pulse-rate of 120 is an indication that the bath should be stopped. Sometimes a cold compress placed on the head is not only grateful to the patient but it makes her feel more comfortable while in the bath. The frequency of a Turkish bath depends upon the strength of the patient and the indications for its use.

THE RUSSIAN BATH.

The steam or Russian is the same as the Turkish bath except that vapor is substituted for hot air. The same cabinet is used for both and their technic is alike in every particular except that a tin or copper bowl containing one pint of water is placed upon the asbestos pad on the gas stove to generate the steam.

THE SHEET BATH.

Action.—The bath is stimulating and tonic and is especially indicated in neurasthenic cases and in women who become physically and mentally exhausted from brain work or sedentary habits.

Technic.—The following articles are required: A wash-tub half filled with water and cracked ice, a muslin bed-sheet, and a towel. The sheet and towel are immersed in the ice-water for five minutes. The patient removes all her clothing and stands alongside of the tub. The nurse now takes the sheet out of the water, quickly wrings it dry, and wraps it completely around

the patient's body. She then wrings out the towel, and holding it in the right hand rapidly slaps the entire surface of the body. The strokes should be quick and sharp and kept up for one or two minutes. The sheet is then removed, the skin quickly dried with a coarse towel, and the patient wrapped in a woolen blanket and allowed to rest for half an hour.

FIG. 104.—SHEET BATH.

The nurse may use her open hands as a substitute for the towel to stroke the surface of the body; the movements should be short and rapid and sufficiently hard to produce stimulation. Good results are obtained, when the patient can afford the expense, from general massage given immediately after the bath and followed by a rest of half an hour.

SALT BATHS.

Action.—Artificial salt water bathing produces a powerful impression upon the skin and stimulates the cutaneous glands and nerves. The effect produced upon the vasomotor nerves is transmitted to the central nervous system, and from there its influence is felt by the respiratory and circulatory organs. As a result the act of respiration is stimulated and the blood-pressure is increased, causing corresponding changes in tissue metamorphosis and in the character of the secretions and excretions of the body.

The effects produced by salt baths also depend upon the temperature of the water. Thus, a cold bath is stimulating or tonic, while warm or hot salt water baths produce a sedative action.

Technic.—Salt baths may be taken in the form of a *full*, *half*, or *sponge* bath. A full description of the technic of these methods will be found under their respective headings, the only difference being that 2 per cent. of sea salt is added to the water.

SEA BATHING.

Sea bathing is a valuable adjunct in the treatment of gynecologic diseases. The stimulating effect of the cold plunge, the exercise in swimming, and the constant motion required while in the surf act as a tonic to the general nutrition by stimulating the tissue changes and promoting the elimination of waste products from the system. These beneficial results are still further enhanced by the change of scene, diet, and air which the patient enjoys at the seashore.

A sea bath must be followed by prompt reaction, otherwise the results are depressing and injurious. The general law already referred to, which governs the effect of a prolonged application of cold to the surface of the body must be borne in mind and the patient instructed as to the length of the bath. The tendency to remain too long in the water should be guarded against and the patient must be told to leave the bath so soon as she feels the slightest sensation of chilliness.

The general condition of the patient should be taken into consideration in determining upon the frequency of the baths. Some women may bathe every day without injurious effects, while others again should not take a bath oftener than every other day or twice a week. The temperature of the air and the water, as well as the state of the weather, should also be considered, as the reaction is more prompt and vigorous, all things being equal, on a clear warm day than when the sky is cloudy and the air chilly. The patient should keep in motion while in the water, as the muscular exertion lessens the depressing effects of the cold and favors reaction. Women who are weak or who naturally react badly after a cold plunge should be prepared for sea bathing by using graduated baths for several weeks before going to the seashore.

After the patient leaves the water she should go at once to the bath-house and not loiter about in wet clothing. The skin should be quickly dried with a coarse towel, and if reaction is delayed or the patient feels a sensation of chilliness after dressing she should take a brisk short walk.

THE VAGINAL DOUCHE.

The vaginal douche is one of the most valuable agents we possess in the treatment of diseases of the pelvis and the vagina, and yet, notwithstanding the frequency of its use, there is no remedy that is so commonly misapplied. The intelligent use of the douche requires not only a knowledge of the physiologic action of heat upon the blood-vessels and nerves, but also a careful attention to the details of the technic of its administration.

Action.—The hot douche acts as a vasomotor stimulant and causes contraction of the blood-vessels. The warm douche produces relaxation of the vasomotor nerves, dilates the blood-vessels, and increases the congestion of the parts. The douche is also employed in a medicated form in the treatment of vaginal diseases, and, finally, it is used for purposes of cleanliness.

Apparatus.—The following articles are required:

1. A reservoir.
2. A douche-pan.
3. A receptacle for the overflow.

1. The reservoir, *a*, should hold at least one gallon of water and be suspended four feet above the patient. It is made of agateware or steel and has a spout near the bottom to which is attached the rubber douching tube. A glass nozzle, *b*, with openings at the end is attached to the tube.

2. The douche-pan, *c*, is made of metal with a small spout near the bottom to which is attached a rubber tube for the overflow.

3. An ordinary wooden or china bucket is placed on the floor to receive the overflow from the douche-pan.

When a patient lies lengthwise in bed or on a lounge the douche-pan is placed upon an ordinary ironing-board which is put crosswise on the bed under her hips to prevent the springs from sagging and interfering with the overflow into the bucket on the floor.

Kelly's surgical pad is substituted for the douche-pan when the injection is given with the patient lying crosswise on the bed and her feet supported by two chairs. In this position the douche may be given by the patient herself or by a nurse. The reservoir and the receptacle are the same as described above. The method is as follows:

An ironing-board is placed lengthwise on the bed under the sheet and the surgical pad laid over it. The reservoir is hung four feet above the bed and the bucket is placed on the floor under the apron of the pad. The patient now lies

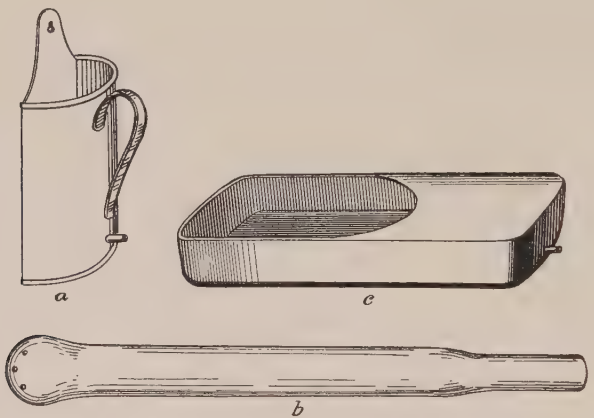


FIG. 105.—APPARATUS USED IN DOUCHING THE VAGINA.
The rubber tubing which is attached to the reservoir and overflow of the douche-pan and the bucket are not shown.

crosswise on the bed so that her hips rest upon the pad and her feet upon the chairs. She then introduces the nozzle of the irrigating tube into the vagina and allows the water to flow from the reservoir. To prevent catching cold a light woolen blanket is thrown over the abdomen and lower extremities.

If a surgical pad is not available a piece of rubber sheeting and a bath towel may be used as a substitute, as shown in figures 16 and 17 on page 26.

A surgical pad should always be used when a douche is given by the physician in his office or when the patient is placed on a table.

Technic.—The vaginal douche may be given as follows:

Hot.	Medicated.
Warm.	Cleansing.

The Hot Douche.—Position of the Patient.—The patient must assume the dorsal posture with the hips raised on a douche-pan. In this position the vaginal vault will be below the orifice of the vagina and hence the water will be in direct contact with the pelvic organs during the administration of the douche. When the injection is given in a stooping position, the water

cannot reach the upper part of the vagina and consequently the direct effect of the heat is lost.

Temperature of the Water.—The water must be between 110° and 120° F. Our object is to obtain the stimulating effects of a high temperature upon the vasomotor nerves and the blood-vessels, and hence the use of tepid or warm water is contraindicated unless we desire to bring more blood to the pelvic organs. The use of cold vaginal douches is injurious.

Duration of the Douche.—The length of each douche must be from fifteen to twenty minutes. The quantity of water is therefore regulated by the rapidity of the flow. The object of a hot douche is to obtain the *secondary effect* of heat and the permanent stimulation which follows the prolonged application of a high degree of temperature; consequently it is not necessary to employ a heavy stream of water, as a small one will answer every purpose and obviate the necessity of having a large reservoir. As a rule, from one to two gallons of water will be sufficient for each douche.

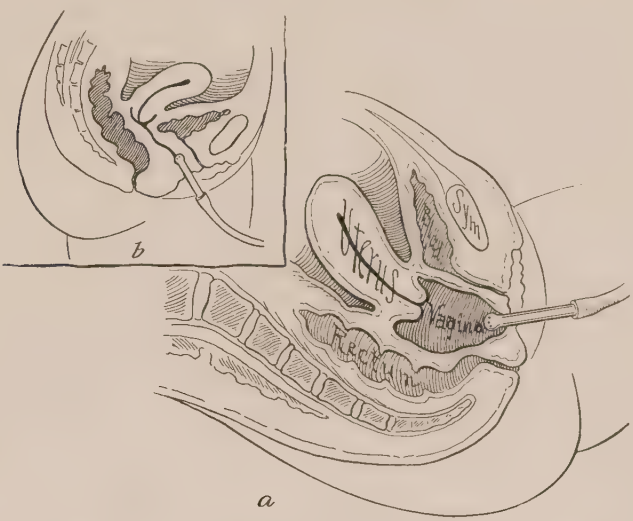


Fig. 106.—Diagrams showing the Correct (*a*) and Incorrect Position (*b*) Assumed by a Patient in Douching the Vagina.

Diagram *a* shows the patient in the dorsal position (correct) and the vagina distended with water. Diagram *b* shows the patient in a stooping posture (incorrect) and the vaginal walls collapsed.

Time of the Application.—The douche is most conveniently given immediately after getting up in the morning and just before retiring for the night.

Frequency.—As a rule, the douche should be given twice daily; but in some cases it may be necessary to use it three or four times a day or even continuously for several hours.

Duration of the Treatment.—The character of the disease and the therapeutic indications govern the duration of the treatment, which, as a rule, covers a considerable length of time. Many cases, however, are benefited after using the douches for several weeks or months, while others again must continue them for two or three years before permanent results are obtained.

The Warm Douche.—The technic is the same as that of the hot douche, except that the temperature of the water is lower—95° to 104° F.

The Medicated Douche.—This variety of douche contains various remedial agents which are used in the local treatment of diseases of the vagina. The apparatus, the position of the patient, and the time of the application are the same as when the hot douche is used.

The water should be warm (95° to 104° F.); the duration should be about ten minutes; the frequency is governed by the nature and acuteness of the disease; and the length of the treatment depends upon the results obtained. Before using a medicated douche the vagina must be irrigated with plain sterile water or saline solution to remove the discharges, and if a poisonous drug is employed, such as corrosive sublimate or carbolic acid, a final injection of sterile water or salt solution is given to wash out the chemical and prevent absorption.

The Cleansing Douche.—This form of douche, as its name implies, is used simply for purposes of cleanliness. The apparatus consists of a fountain syringe and a basin. The syringe is filled with warm water (95° to 104° F.) and suspended upon a hook four feet above the floor. The woman now stoops over the basin, inserts the nozzle into the vagina, and allows the water to flow from the syringe. The quantity of water used at each injection need not exceed two quarts. The best time to use the douche is in the morning or at night. As a rule, one douche a day is sufficient unless the woman has a profuse leukorrhea, in which case it may be given more frequently.

If the injections are given by a nurse, the same apparatus is used as when a hot douche is employed.

THE INTRAUTERINE DOUCHE.

Action.—The *hot* douche acts as a stimulant to the vasomotor nerves, the blood-vessels, and the muscular fibers of the uterus. The *medicated* douche is employed in the treatment of septic conditions of the uterus and after intrauterine operations.

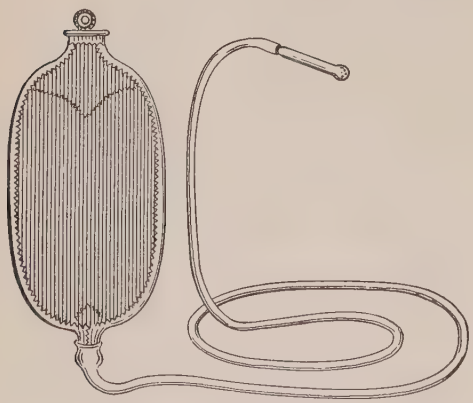


FIG. 107.—FOUNTAIN SYRINGE WITH A GLASS IRRIGATING NOZZLE ATTACHED.

When the syringe is used for giving an intrauterine douche a return flow catheter (Fig. 109) is substituted for the glass nozzle.

Apparatus.—The following articles are required:

1. A reservoir and thermometer.
2. A return-flow dilating catheter.
3. A surgical pad or a douche-pan.
4. A receptacle for the overflow.

1. The best reservoir for general use is a fountain syringe holding three quarts of water. In hospital practice a graduated glass reservoir and a combination thermometer is the best form of apparatus to employ.

2. The catheter shown is simple in construction, and therefore easily sterilized and not likely to get out of order. The return flow is readily regulated by a screw, which expands or contracts the two heavy wires that are placed parallel with the inflow tube. The catheter is connected with the reservoir by the rubber irrigating tube.

3. The surgical pad or the douche-pan is the same as described under vaginal douches.

4. The receptacle for the overflow consists of an ordinary metallic or china bucket.

Technic.—If the patient is very weak she must not be disturbed, and consequently she should lie lengthwise in the bed with her hips resting on a

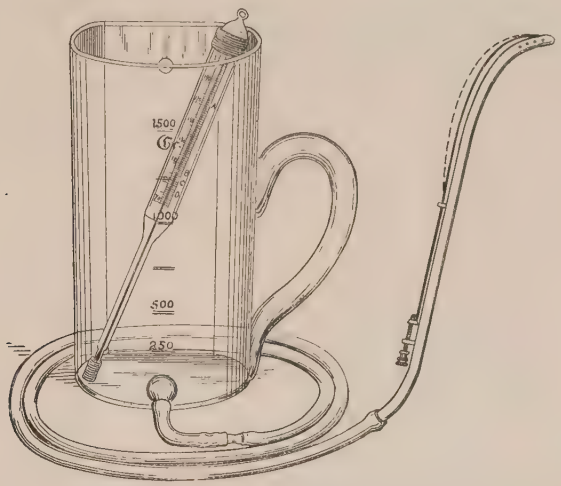


FIG. 108.—GRADUATED GLASS RESERVOIR, COMBINATION THERMOMETER, AND RETURN-FLOW DILATING CATHETER USED IN GIVING AN INTRAUTERINE DOUCHE. (AUTHOR'S APPARATUS.)

douche-pan and her knees drawn up. The end of the overflow tube is then placed in the bucket on the floor and the reservoir is held by an assistant four feet above the bed.

If the patient is strong enough to move, the douche may be more conveniently given with the woman lying crosswise on the bed and her feet supported by two chairs or adjustable leg-holders. An ironing-board is placed lengthwise along the edge of the bed and a surgical pad laid upon it. The patient is now placed

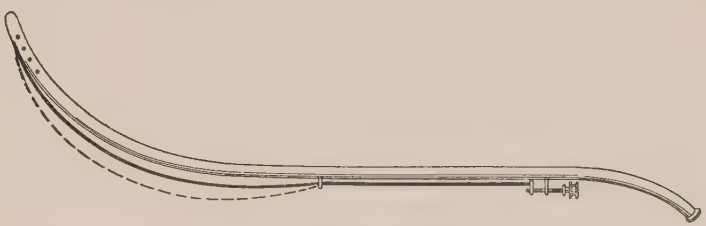


FIG. 109.—RETURN-FLOW DILATING CATHETER.

so that her hips rest upon the pad and her feet on the chairs or in the adjustable leg-holders. The bucket is then placed on the floor under the pad and an assistant holds the reservoir four feet above the bed.

Occasionally it may be very difficult or even impossible to introduce the catheter with the patient lying in bed, and consequently she should be placed on a kitchen table in the dorsal position with her hips resting upon a surgical pad.

If the patient is lifted carefully from the bed onto the table, no harm will result even when she is very weak.

Having placed the patient in the proper posture, the physician then introduces one or two fingers of the left hand into the vagina and locates the os uteri. Holding the catheter in the right hand, he now introduces the instrument into the vagina and, using the internal fingers as a guide, passes it directly into the uterine cavity up to the fundus.

Before introducing the catheter into the vagina, however, the assistant must allow the water to flow through the instrument; otherwise air may be carried into the uterus. After the catheter enters the uterine cavity the physician withdraws his fingers from the vagina and the patient is protected from catching cold by throwing a light woolen blanket over her body and lower extremities. When the douche is finished, the external organs and the hips are quickly dried with a soft towel and the patient made comfortable in bed.

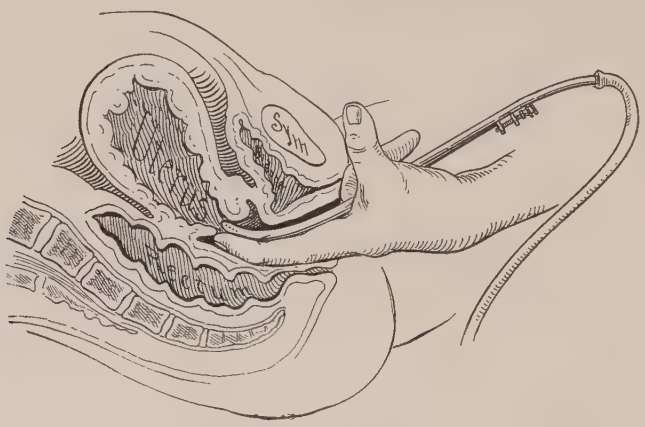


FIG. 110.—INTRODUCING A CATHETER INTO THE UTERINE CAVITY.

The Hot Douche.—Temperature.—The water must be between 110° and 120° F. Quantity.—The amount of water required depends upon the promptness with which the effects of the heat manifest themselves; usually from one to two gallons are sufficient. Frequency.—The frequency is governed by the subsequent indications.

The Medicated Douche.—The medicated douche must always be followed by an injection of warm sterile water (95° to 104° F.) or salt solution to wash out the chemic agent and prevent absorption. Temperature.—The water must be between 95° and 104° F. Quantity.—The usual amount of water required is between one and two gallons. Frequency.—The frequency is controlled by the subsequent indications.

ICE-BAG; HOT-WATER BAG; COMPRESSES.

Action.—The use of an *ice-bag* or a *hot-water bag* enables us to make a continuous local application of an extreme degree of heat or cold, and consequently its action is stimulating to the parts over which it is applied. On the other hand, however, when a *hot* or *cold compress* is first applied to the surface of the body its intense degree of temperature acts for a time as a stimulant, but

later on a sedative and relaxing action is produced by the continuous application of a moderate temperature combined with the warm vapor that is gradually generated by the heat of the body and the moisture in the fomentation. In other words, a compress eventually produces superficial hyperemia and acts as a poultice.

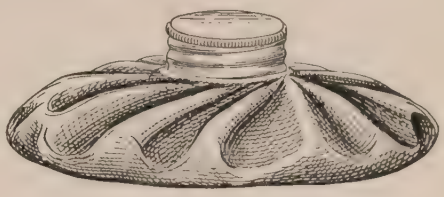


FIG. 111.—ICE-BAG.

Ice-bag.—The rubber ice-bag shown is the most convenient one to use. The bag is filled with cracked ice, which should not be too fine, as large pieces take longer to melt. Before screwing on the cap the air is expelled from the bag by squeezing it in the left hand. If this is not done, the retained air inflates the bag and makes it difficult to adjust and keep in place.

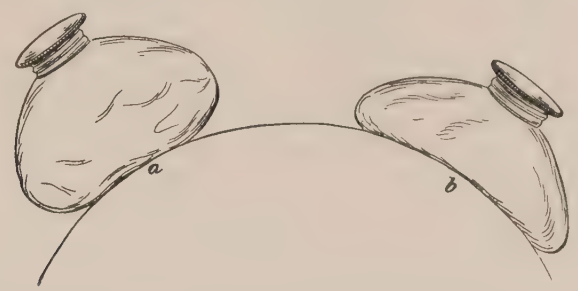


FIG. 112.—INCORRECT (*a*) AND CORRECT METHOD (*b*) OF APPLYING AN ICE-BAG.
Note that in illustration *a* the bag is distended with air and does not adjust itself to the surface of the body. In illustration *b* the air has been expelled before screwing on the cap and the bag hugs the parts closely.

The bag is placed directly on the skin and allowed to remain for an hour or more, or it may be applied several times daily. Sometimes the application is continued without intermission for several hours at a time. If the skin is sensitive or the application is prolonged, the cutaneous surface should be protected by four layers of muslin placed between it and the bag.

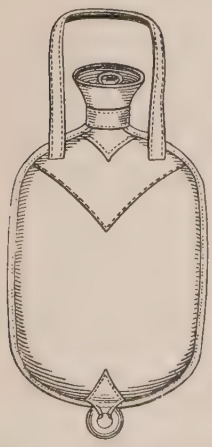


FIG. 113.—HOT-WATER BAG.

Hot-water Bag.—The hot-water bag shown is made of rubber and sold in the drug-shops.

The bag is filled with boiling water or with water coming directly from the hot spigot. The water must be very hot, otherwise the effect of a high temperature is not obtained. The surface of the body must always be protected by placing flannel around the bag; very severe skin burns have been caused by neglecting this precaution.

An ordinary beer bottle or a hot stove plate enveloped in flannel is a good substitute for a hot-water bag when the latter is not available.

Compresses.—Hot and cold compresses are applied to the abdomen or the lumbosacral region. They consist of towels, cloths, or surgical lint wrung out of water and covered with oiled silk or rubber

sheeting to prevent evaporation and to retain the temperature. A compress should consist of several layers of the material employed, otherwise it will not be thick enough to hold the moisture or the temperature for any length of time.

A cold compress is soaked for one or two minutes in iced water and then squeezed dry with the hands.

FIG. 114.—METHOD OF WRINGING OUT A HOT COMPRESS WITHOUT SCALDING THE HANDS.

A hot compress is dipped into water that has been brought to the boiling-point and then wrung out very dry. Unless the moisture is entirely removed the skin will be scalded and a bad burn will result. A simple method of wringing out a hot compress is to pick it out of the water quickly and drop it into a towel, which is then twisted tightly upon itself.

The physician or the nurse should first test the temperature with his or her hands before applying the fomentation to the patient's body.

WATER-DRINKING.

The importance of water-drinking as an auxiliary in the treatment of disease and its intelligent use as a part of the daily routine diet are frequently overlooked, and patients are seldom instructed as to the quality, quantity, or temperature of the water which they drink or the marked differences in its effects when drunk with the meals or upon an empty stomach.

Action.—Abundant water-drinking acts as a flush, so to speak, to the entire system by increasing the quantity of the watery and solid constituents of the urine, stimulating intestinal peristalsis, favoring perspiration, and enhancing the excretion of carbonic acid and the absorption of oxygen. As the result, therefore,

of these impressions upon the organs of the body the products of retrogressive tissue change are eliminated, and the waste materials retained in the tissues, as well as lime and other salts, are removed. These results depend not only upon the quantity and quality of the water, which are undoubtedly the principal factors, but also upon its temperature when taken into the stomach. According to Glax, the local and general effects of heat and cold are similar whether the application is made externally to the skin or the fluid is taken or injected into a cavity of the body; thus, we find that hot and cold water when taken into the stomach differ in their effects in precisely the same manner as when a high or low temperature is applied to the skin.

Quality of the Water.—It is imperative that drinking-water should be pure and that it should contain no pathogenic germs or mineral matter. The necessity for using water that is free from germ life is widely appreciated at the present day, as the investigation of the causes of typhoid fever, cholera, and other enteric disorders has fully demonstrated the important rôle which impure water plays in the causation of these and kindred diseases. Unfortunately, however, the opinion prevails that if we use a water free from germ life or one that has been made sterile by boiling there remains no necessity for considering further the question of quality. This view, however, is only half of the truth, and it has been responsible in the past for overlooking the injurious effects produced by using water that contains mineral matter but is otherwise pure. Furthermore, a common idea prevails that the mineral salts of water are required for the proper maintenance of health, and that if a water is used which does not contain these salts the individual must necessarily suffer physically. Nothing, however, can be further from the truth, as the food we eat supplies in abundance all the mineral salts required by the system. This statement is confirmed by the experience of the American Navy, which has been using distilled water exclusively for drinking purposes for several years, with a marked improvement in the health of the men attached to the service.

Water not only acts mechanically as a flush to the general system, but it also removes the impurities and the earthy salts from the tissues by virtue of its solvent properties. It naturally follows, therefore, that the purer the water, the greater its absorbent power and the more thoroughly will it take up and remove these salts. The power of absorption possessed by water is in direct proportion to the amount of mineral matter it contains, and consequently it is a matter of great importance for us to know the chemic properties of the water we drink. Water that is free from mineral matter possesses powerful absorbent qualities, and when taken into the system it becomes saturated with the impurities and the earthy salts which are deposited in the tissues and carries them off through the excretory organs of the body. A hard water, on the other hand, is more or less saturated with mineral salts, and consequently its absorbent power is greatly limited or altogether destroyed. The absorbent power of pure water may be compared to a fresh blotting-pad, which, as we all know, will take up quickly a large quantity of ink, whereas a blotter that has been in use is slow and limited in its action.

It is almost impossible to over-estimate the ill effects of drinking water that contains mineral matter. The various salts of lime become deposited in all the tissues, and eventually calcareous changes take place in the blood-vessels and organs of the body. The excretory and secretory organs become sluggish and a long list of diseases results which are directly traceable to this cause. Moreover, in many instances old age appears prematurely, as the general system becomes so encrusted with these salts, so to speak, that it is unable to perform its functions properly.

Distilled water fulfils all the requirements of an ideal drinking-water, and should therefore be used as a daily part of the diet in preference to all other waters. It contains no bacteria and consequently cannot transmit the specific germs of disease, and as it is free from earthy salts and solid matter its solvent properties are unsurpassed. When, however, this water is not obtainable we should select as a substitute one which contains a minimum amount of solid matter. There are a number of good natural waters on the market that are free from germ life and which contain but a small percentage of mineral salts as shown by the analysis of their chemic properties.

The custom of using filtered water for drinking purposes cannot be too strongly condemned, as filtration does not remove the mineral salts which are held in solution; consequently the water has poor solvent powers and does not remove the lime salts from the tissues. Furthermore, the domestic filter requires constant cleaning and sterilizing, otherwise the bacteria which accumulate in the apparatus increase the likelihood of germ infection. Boiling filtered water will, of course, destroy this danger, but it does not remove the earthy salts.

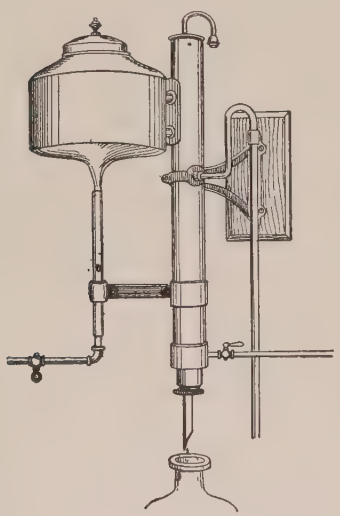


Fig. 115.—External View.

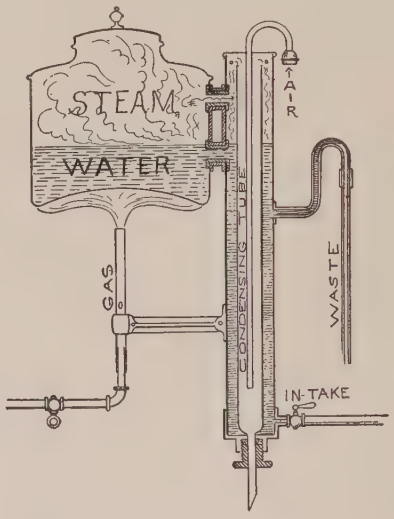


Fig. 116.—Sectional View.

The Parmelee Still.

Special Directions.—Distilled water may be bought from a retail or wholesale druggist or from a company that makes a business of distilling water for drinking purposes. Water from the latter source is preferable, as it is handled with antiseptic precautions, aerated, and put up in convenient size bottles at a lower cost. While this water is usually reliable and up to the standard of purity, yet the ideal plan is to have a distilling apparatus in the house, as we are then not only absolutely certain of the quality and freshness of the water, but we can produce it cheaper.

The best apparatus for this purpose, in my judgment, is "the Parmelee Automatic Aerating Water Still and Sterilizer," which I have used in my own home for several years and which has supplied all the drinking-water used by the household.

This still is simple in construction, automatic in action, and may be operated with either gas or oil; if the latter is used, a blue flame Primus or Khotal oil

stove should be employed. As the water issues from the still it is collected in a large glass bottle, which is subsequently corked with a glass stopper and put in a cool place. It is advisable to have six half-gallon bottles so that there may always be plenty of water on hand. The bottles must be sterilized by boiling before they are refilled.

If, as has been already stated, distilled water is not obtainable, we may use one of the natural waters containing a minimum amount of earthy matter. The following waters which are on the market have been analyzed to determine the number of grains of solid material to the gallon (U. S.):

New York :	The Colonial Springs of Long Island,	2.50
Maine :	The Poland Springs,	3.76
	The Highland Springs,	4.78
Massachusetts :	The Commonwealth Mineral Spring,	2.45
	The Massasoit Spring,	3.43
	The Nobscot Mountain Spring,	3.21

Administration.—A person in normal health should drink from one to two quarts or more of water daily. It is a good routine practice to drink a glass of water immediately upon getting out of bed in the morning and just before retiring for the night. The water taken in the morning clears the mucus from the stomach, stimulates the peristaltic action of the bowels, and improves the appetite and general tone of the system. Only a small quantity of water should be taken at meals, as a large amount dilutes the digestive fluids and causes dyspepsia in those who have weak stomachs; this is especially true of ice-water, as the action of cold under the circumstances retards digestion. In addition, excessive drinking at meals is often the cause of obesity in those having a natural tendency to accumulate fatty tissue. It is important that the largest part of the daily consumption of water should be drunk when the stomach is empty, and at least one hour and a half should elapse after eating before drinking. Water may, however, be drunk a short time before meals, as it is rapidly absorbed, and hence does not mix with the food subsequently taken into the stomach.

FIG. 117.—SPECIAL FORM OF COOLER WHICH IS SO CONSTRUCTED THAT THE WATER SURROUNDS BUT DOES NOT COME IN DIRECT CONTACT WITH THE ICE (page 102).

In regulating the use of water in an individual case we must be guided by the pathologic conditions present and by the personal peculiarities of the patient. This naturally applies more especially to the quantity and temperature of the water as well as to the time of its administration. Thus, when hot water is used as an aid to digestion it must be drunk one hour before eating and as hot as can be borne.

The question of the purity of the ice which is used in cooling drinking-water is an important one not only when the water is employed therapeutically, but also when it is drunk by the family. The value of distilled water is due to its freedom from germ life and mineral matter, and if the ice contains these impurities

the water becomes infected and its solvent properties impaired. It is important, therefore, that the water should be cooled by keeping the bottles in the ice-chest or by using a special form of cooler that is sold in the shops and which is so constructed that the water surrounds the ice without coming in direct contact with it (Fig. 117).

CHAPTER VIII.

CONSTIPATION.

The frequency of constipation in women and its evil effects upon the general system, as well as its being the cause of many symptoms that are mistaken at times for the manifestations of pelvic disease, make the subject one of great importance to the gynecologist, and I shall therefore discuss it more or less fully.

Definition.—Constipation or costiveness may be broadly defined as the retention of feces from whatever cause.

Causes.—The condition may be produced by a number of causes either of a *general* or a *local* character.

Among the *general causes* may be included sedentary habits, particularly in women past the middle period of life; heredity; chronic diseases, especially of the liver, stomach, or intestines; nervous disorders, such as hysteria or neurasthenia; errors in diet, particularly that form of diet leaving too little residue; and, lastly, drugs, such as opium or lead.

Of the *local causes*, there are: relaxation of the abdominal walls from overdistention or obesity; atony of the bowel, which is most commonly produced by repeatedly disregarding the desire for evacuation; contraction of the colon, resulting from chronic diarrhea or dysentery; pressure from tumors, such as an ovarian cyst or an enlarged or displaced uterus; and, finally, lacerations of the pelvic floor which result in the formation of a rectocele.

Symptoms.—One bowel movement a day may be considered as normal, but it is to be borne in mind that there are certain individuals who commonly have two or three movements daily, and, on the other hand, there are those who go for days at a time without suffering any inconvenience. As a rule, however, constipation either of the temporary or habitual variety usually presents certain definite symptoms, as lassitude, headache, depression of spirits, loss of appetite, a heavy or foul breath, and a coated tongue. In hysteric or neurasthenic women palpitation of the heart, cold hands and feet, neuralgic pains, and a sense of fullness in the pelvis during the menstrual periods are added to the usual symptoms.

When constipation is prolonged more serious damage may result, as hemorrhoids, overdistention of the colon, the formation of ulcers, or perforation. As a result of the accumulation of hardened masses of fecal matter (scybala) in the sacculations of the gut, stercoral ulcers may develop from the constant irritation of their presence. The formation of these ulcers may be suspected if the stools contain slight amounts of blood or pus, or if in the case of an individual habitually constipated a diarrhea ensues. Another source of diarrhea in such cases is the channeling or grooving of the impacted mass, and nausea and vomiting may then accompany the other manifestations of the condition. Palpation of the abdomen and rectal exploration will disclose the presence of the impacted feces.

Anemia of a slight degree is sometimes present in persistent constipation. In that form of anemia termed chlorosis, constipation of an obstinate type is frequently encountered.

Diagnosis.—The existence of constipation, as a rule, presents little difficulty. The important point to be determined is the exciting cause, for upon this depends its relief.

The most common error is to mistake a mass of fecal matter in the cecum, or in the hepatic or splenic flexure of the colon, for an abdominal tumor. In some instances aneurysm of the abdominal aorta has been diagnosticated when the pulsations of a normal aorta were imparted to an impacted fecal mass in the colon. Placing the patient in the knee-chest position, thus allowing the colon to fall away from the aorta, makes the distinction clear. Free purgation will either entirely remove the fecal masses with complete disappearance of the tumor or make it evident that the constipation was secondary to pressure from a tumor of permanent nature.

Treatment.—In treating constipation the exciting cause should be removed if possible. Having in mind that evacuation of the bowels is a normal and should be a daily procedure, the simplest methods of correction should be practised first; recourse to drugs should be the last resort. In the first place, the patient should be instructed to go to the water-closet every morning after breakfast, as the bowel frequently acquires the habit of responding to the stimulus when this is persisted in. The sipping of a glass of hot water at bedtime and again before breakfast in other cases is often quite sufficient to bring about the desired result. In those, again, in whom the tendency to constipation is slight the use of coarse-grained oatmeal, prunes, or figs is all that is necessary to keep the bowels open.

Diet.—An exclusive or nearly exclusive meat diet is not an uncommon cause of constipation in that it leaves but little residue. This may be counteracted by the use of foods in which the residue after digestion is relatively large, such as spinach, celery, lettuce, corn, tomatoes, and fruits, as well as the coarse-grained cereals. Therefore, in selecting a diet for the habitually constipated those articles of food possessing this property of leaving a large residue after digestion should always be chosen. Milk, in so many respects an ideal food, is not a good article of diet for the constipated, as it is open to the great objection of leaving but little residue, and thus either directly causes or increases the tendency to constipation.

Exercise.—As sedentary habits are among the most frequent causes of constipation they should be corrected and the patient instructed to exercise in the open air by riding, walking, or cycling. Indoor exercises are also beneficial, especially those affecting the abdominal muscles (see p. 117), and they should be taken for a few minutes every night and morning. General massage also gives good results and the peristaltic action of the intestines should be stimulated by deep kneading of the abdominal muscles.

Drugs.—The great objection to the use of drugs is the formation of a habit or toleration, thus making the constipation worse. To the large number of purgative and laxative drugs this objection holds good except when temporary evacuation is desired, as preparatory to a surgical operation, or when temporary unloading of the bowel is indicated for other reasons. Thus, rhubarb and castor oil if habitually used ultimately increase constipation, and mercury disorders the digestion and injures the teeth.

When constipation is due to atony as a result of deficient innervation of the intestines the use, for several weeks, of a pill containing nux vomica and belladonna will prove beneficial:

℞. Extracti nucis vomicæ, ... gr. ¼
Extracti belladonnæ, ... gr. $\frac{1}{10}$
M. Ft. pil. no. i.
Sig.—To be taken at bedtime.

To the above pill may be added *aloin* gr. $\frac{1}{6}$ if it should be desirable to increase intestinal peristalsis. This drug, however, should not be continued for too long a period of time, as it has a tendency to produce atony of the bowel. Neither should it be employed by pregnant women nor by individuals suffering from pelvic congestion, from hemorrhoids or other forms of rectal irritation. When it is desired to increase the biliary flow and thus increase intestinal peristalsis, the pill of belladonna and nux vomica may be much increased in efficiency by the addition of *podophyllin*, gr. $\frac{1}{8}$.

Of all drugs for constipation, perhaps the most satisfactory is cascara sagrada. It is unattended with griping, does not increase the tendency to costiveness, and may be used for long periods at a time without producing toleration. It is best given as the *fluid extract* in doses of from 10 to 30 drops, or in pill form, in combination, as in the following:

℞. Extracti cascaræ sagradæ, ... gr. ij
Extracti nucis vomicæ, ... gr. $\frac{1}{4}$
Extracti belladonnæ, ... gr. $\frac{1}{10}$
Aloini, ... gr. $\frac{1}{6}$
vel Resinæ podophylli, ... gr. $\frac{1}{8}$
M. Ft. pil. no. i.
Sig.—To be taken at bedtime.

Aperient Waters.—The best known are the Congress, Hathorne, Saratoga, Carlsbad, and Friedrichshall waters, any one of which may be given in doses of from six to eight ounces; *i. e.*, an ordinary tumblerful. This dose, however, may be increased or diminished to suit the individual case.

The great field for the use of these waters is in that class of women who suffer from so-called hepatic torpor, or congestion. Such individuals are usually past the middle period of life, are high livers, take too little exercise, and are of the apoplectic type. As a result they usually suffer from constipation and a catarrhal inflammation of the gastro-intestinal tract.

When it is desired to use an aperient water for any length of time the dose should be so regulated as to secure an easy and copious evacuation daily, large watery movements being avoided, as they become exhausting. A half glassful of Hunyadi Janos, for instance, diluted with tepid water and taken before breakfast will usually secure the desired result. When the use of such waters is accompanied with griping pains, as sometimes happens, the addition of ten or fifteen drops of spirits of camphor or of chloroform will usually obviate the difficulty.

Individuals of the class just referred to often derive great benefit from a visit to some one of the well-known mineral springs, such as the Saratoga Springs in New York or Carlsbad or Marienbad in Bohemia. The taking of these waters with its attendant free purgation, the prescribed exercise, and strict dietary regimen to which patients are subjected, result in benefit often felt for months afterward.

Suppositories.—Suppositories should be resorted to only for the temporary relief of constipation and should not be relied upon in the treatment of the habit.

The official glycerin suppository is efficacious and may be employed to meet certain indications; it must be borne in mind, however, that its too long-continued use may produce irritation of the rectum. For the relief of very mild constipation the so-called gluten suppository will at times be found useful.

Enemata.—A rectal enema will prove of service for affording temporary relief under various conditions. When constipation is of mild degree, probably the most effective enema consists of a quart of warm water, temperature 100° F., and castile soapsuds; this is the ordinary "*house*" or simple enema. Should

constipation be attended with bleeding hemorrhoids, the daily injection of half an ounce of the distilled extract of witch-hazel or a pint of cold water will usually be of benefit. When a more stimulating enema is desired, the following, sometimes called the "*ox-gall*" enema, will often give the wished-for result:

Powdered ox-gall,	gr. xx
Glycerin,	f℥j
Water and soapsuds (105° F.),	Oj

Rub up the ox-gall powder with the glycerin, adding the latter very gradually until a perfectly smooth paste is made, and then thoroughly mix it with the water and soapsuds.

The mixture at a temperature of 100° F. is then injected into the bowel through a large-sized rubber catheter, or, better, through a flexible colon tube passed as far in as possible, the patient lying upon the left side or in the knee-chest position. In this way the injection is given high in the bowel, where it should be allowed to remain for two or three hours before the bowels are moved.

For obstinate constipation good results may be obtained by the use of oil, as follows:

Castor oil or olive oil,	f℥j
Castile soapsuds (100° F.),	Oij

These should be mixed as thoroughly as possible and one drachm of spirits of turpentine beaten up with the yolk of an egg added.

A plain enema of soapsuds is best made of brown soap and from one to two quarts of hot water; its efficiency may be augmented by the addition of one ounce of glycerin and a drachm of spirits of turpentine.

A useful enema will be found in the following:

Sulphate of Magnesia,	℥ij
Glycerin,	f℥ij
Spirits of Turpentine,	f℥j
Hot water (100° F.),	Oj

An ounce of *glycerin* injected into the rectum with a small hard-rubber syringe is usually followed by prompt results; it should be used in preference to the suppositories, which are not so certain in their action.

The following enema is useful in obstinate constipation: Six ounces of olive oil at a temperature of 100° F. The injection should be given through a rectal tube high in the bowel with the patient in the left lateral-prone or knee-chest position.

Should constipation be associated with excessive tympanites, the injection of a pint of milk of asafetida will be beneficial.

CHAPTER IX.

DIET.

One of the most neglected subjects in the practice of medicine and surgery is that of dietetics. Except in general terms few, if any, of the text-books give specific directions in the matter of diet. Proper attention to the subject will save not a few cases and avoid a protracted convalescence in others. In surgical cases the question of diet is most important, as a nourishing and suitable diet has not a little to do with the speedy healing of wounds.

In prescribing a diet for the individual case care should be taken, so far as possible, to order articles of food that are acceptable to the patient. Milk, while acceptable to most, is sometimes distasteful, and simply because it is an ideal food its administration should not be insisted upon at the risk of a disordered digestion. Again, food should be given at a definite time, as an individual anticipating its administration will often refuse it if offered before or after the time expected. The appetite is sometimes stimulated by making the service of food as attractive as possible; and of the utmost importance is the serving *hot* of food intended to be hot and the serving *cold* of food meant so to be; the intermediate stage of lukewarmness is to be carefully avoided. The awakening of a patient for the administration of food is, as a general rule, to be deprecated, particularly during the night. If the patient is asleep at the time set for feeding, it is better, except in well-defined instances, to wait until she awakens for the giving of food. Overloading the stomach is to be as carefully avoided as underfeeding, as it may cause the stomach to rebel and defeat the particular object for which we are striving. Attention to the bowels, the renal secretions, and the condition of the tongue, will usually show whether the food is being properly assimilated or not.

It is important to have a large diet list to choose from in order to be able to tempt the patient's appetite and to select the most acceptable food in an individual case. The physician should not only have a definite knowledge of the proper articles of diet to use under various circumstances, but he should also know how they are prepared, so that he can give the nurse precise directions, if necessary, and make sure that the patient is receiving what was ordered.

LIQUID DIET.

The following articles of food are the chief forms of liquid diet used for the sick and in the preparatory and post-operative feeding of patients.

Milk.—Milk may be taken hot or cold. It may be flavored with sugar, salt, tea, coffee, or vanilla, and it may be diluted one-fourth with plain soda, or lime-water, or with seltzer, vichy, or apollinaris.

Milk-shake.—Take six ounces of fresh milk and add two teaspoonfuls of sugar and flavor with a teaspoonful of vanilla. Place all in a wide-mouthed bottle with some cracked ice; cork securely and shake well for one or two minutes.

An entire egg or the albuminous portion only may be added previous to shaking; and wine may be substituted for the vanilla.

Peptonized Milk.—This is best prepared with Fairchild's peptonizing-tubes, each of which contains 5 grains of extract of pancreatin and 15 grains of bicarbonate of soda.

The Cold Process.—Place the contents of a tube in a clean quart bottle with about four ounces (or a teacupful) of cold water and shake well. Then add one

pint (or two tumblerfuls) of cold milk and shake again; after which it should be placed on ice until ready for use. It may be sweetened with a little sugar if desired.

The Warm Process.—Mix the peptonizing powder with water and milk as in the cold process, and then place the bottle in water at a temperature of 100° F. (or water in which the hand can be comfortably placed) for ten minutes. Then place on ice to prevent any further digestive action.

Koumiss.—Dissolve one-third of a cake of Fleischmann's yeast in a small quantity of warm water; add this to a quart of fresh milk warmed to blood-heat (99° F.) and sweeten with a teaspoonful of sugar. Pour this mixture into clean beer bottles with adjustable rubber corks; shake the bottles for one minute to mix the ingredients thoroughly, and then place them on end in a warm place (80° F.) for at least twelve hours. The bottles are then placed on their sides in a refrigerator until ready for use.

Pasteurized Milk.—This process consists in raising the temperature of the milk to 167° F. and keeping it at that point for half an hour. Pasteurization is accomplished as follows:

Put the milk in sterile bottles and stopper with cotton batting which has been baked brown in the oven. Then place the bottles in a covered pail and pour in water actually boiling at the time until they are immersed up to their necks. Allow the bottles to remain in the pail for thirty minutes and then place them in a refrigerator until needed. The technic may be varied by first bringing the water to a boil in the pail and then removing it from the range after putting in the bottles. This method raises the temperature of the milk to 167° F. and maintains it at that point for half an hour while the water in the pail is cooling.

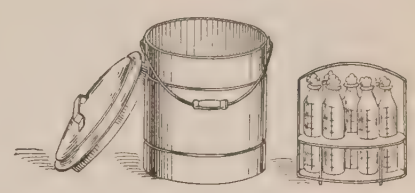


Fig. 118.—Apparatus for Pasteurizing Milk.

Pasteurizers are now for sale in the shops which are simple in construction and make the process very convenient. They consist of a tin or copper pail with a lid and a wire rack to hold the bottles.

A temperature of 167° F. destroys all bacteria that are likely to be present and does not alter the properties of the milk to the same extent as sterilization. The milk is also easier to digest and tastes more like fresh milk. Pasteurized milk will keep sweet for twenty-four hours, but after that time it spoils, and should not be used for food.

Sterilization of the Bottles.—After using the milk the bottles are thoroughly rinsed with hot soapsuds and left standing filled with water which contains 1 per cent. of soda or borax. Before refilling the bottles with milk they are carefully rinsed and boiled for ten minutes in plain water.

Cotton Batting Plugs.—In hospitals the cotton batting which is used to stopper the mouths of the bottles is sterilized in a high-pressure steam sterilizer, but in private houses this method cannot be carried out and it will be necessary to bake the cotton in a hot oven until it turns a light brown. The importance of sterilizing the cotton which is used to stopper both Pasteurized and sterilized milk bottles should always be borne in mind, as the degree of heat applied in these processes is insufficient to destroy the bacteria in the cotton, and consequently the milk will eventually become infected from this source.

Sterilized Milk.—This process consists in raising the temperature of the milk to 210° F. and keeping it at that point for thirty minutes. The sterilization

may be accomplished as follows by means of Arnold's milk sterilizer, which is an inexpensive apparatus:

Put the milk in sterile bottles and stopper with cotton batting which has been baked brown in an oven. The bottles are then put in the wire rack and placed in the sterilizer. The lid is now put over the sterilizer, water for generating steam poured into the bottom receptacle, and the apparatus placed on the range. When the water begins to boil, the steam ascends into the sterilizer and surrounds the bottles, heating the milk to 210° F. (actual test made by the author). The milk is subjected to this atmosphere of steam for thirty minutes, when the bottles are removed from the sterilizer and placed in a refrigerator.

A simple method of sterilizing milk without using a specially constructed apparatus is accomplished as follows: The bottles are filled with milk and plugged with cotton batting as described above and placed in a tin pail. The pail is then filled with water up to the necks of the bottles and placed on the range. The water is now boiled slowly for thirty minutes, when the bottles are removed and placed in a refrigerator until needed. From tests made by the author with a self-registering thermometer it was found that this process raised the temperature of the milk to 208° F.

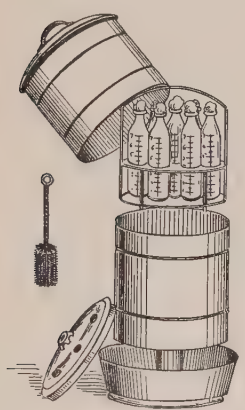


Fig. 119.—Arnold's Apparatus for Sterilizing Milk.

It is now generally admitted that the alteration which occurs in the properties of milk prepared by sterilization is greater than by Pasteurization, and hence the latter method should always be employed except when it is necessary to keep the milk for several days. Sterilized milk will keep in good condition for a week or more, and can therefore be carried upon a voyage across the ocean. Its taste is characteristic and is somewhat similar to that of boiled milk.

Albuminized Milk.—Add the white of an egg to half a tumblerful of milk and mix it by passing the blade of a knife *gently to and fro* in the tumbler. The mixture must not be beaten, as violent agitation coagulates the albumen and destroys its digestibility.

Milk Punch.—Take one cupful of milk, two tablespoonfuls of whisky or brandy, one teaspoonful of sugar, and a nutmeg. The milk is first sweetened with the sugar, the whisky or brandy added, and the whole thoroughly mixed by pouring from one glass to another. Then grate a little nutmeg over the top. If the ingredients are shaken in two tin cups, one of which fits closely into the other, it makes a better and more attractive punch.

Buttermilk.—Buttermilk should be fresh every day and kept in the refrigerator until ready for use.

Albumin Water No. 1.—Add the white of an egg to a tumblerful of ordinary lemonade and mix it by passing the blade of a knife *gently to and fro* in the tumbler; the albumen coagulates if the mixture is beaten.

Albumin Water No. 2.—Add the white of an egg to half a tumblerful of ice-water, mix as in No. 1, and season with a little salt.

Eggs.—An egg may be taken raw and swallowed whole as an oyster by breaking it carefully into a wineglass and adding a little vinegar, salt, and pepper. Another method is to pour a tablespoonful of sherry or Madeira wine into a wineglass and break an egg over it.

Egg-nog.—Put the yolk of an egg in a tumbler and mix it well with a teaspoonful of sugar. Then add a tablespoonful of brandy, whisky, or sherry wine and fill the tumbler about two-thirds full with ice-cold milk. Then mix thoroughly by pouring from one glass to another or shaking in two tin cups and strain into a tall thin glass. Beat the white of the egg to a stiff froth, add a little sugar, and place it on the egg-nog. Then grate some nutmeg over the top.

Egg Lemonade.—Thoroughly beat one egg with a tablespoonful of sugar and then mix with a wineglassful of water and the juice of a small lemon. Pour the whole into a tumbler containing pounded ice and stir with a spoon.

Clam Broth.—Six large clams in their shells and a cup of water will be needed for this broth. Wash the shells thoroughly with a brush and place the clams with the water in a kettle over the fire. The broth is simply the juice of the clams and the water boiled for one minute. It does not require seasoning, as the clam juice itself is usually salt enough. When the shells open, the clams are taken out of the kettle and the broth strained through a double layer of cheese-cloth or a fine strainer. The broth may be served hot or cold.

Oyster Broth No. 1.—Select eight fresh oysters, chop them fine in a chopping-tray, and turn them into a saucepan with a cup of cold water; set the saucepan on the fire and let the water come slowly to the boiling-point, then simmer for five minutes; strain the liquid into a bowl, flavor with half a saltspoonful of salt, and serve hot.

Oyster Broth No. 2.—Put a dozen large oysters with their liquor into a stew-pan and allow them to simmer for five minutes. Then strain the liquor, leaving out the oysters, and add to it half a cupful of milk or water; set it back on the stove and heat it just to the boiling-point. Flavor with pepper and salt.

Chicken Broth.—An old fowl will make a more nutritious and tasty broth than a young chicken. After cleaning and removing all that is not clear flesh the fowl is cut into small pieces and placed in a saucepan. It is then covered with cold water, allowed to simmer for two hours, and finally to boil slowly for two hours more. It is then strained and placed aside to cool, when the fat is carefully skimmed off. It is served hot and seasoned with pepper and salt.

Mutton Broth.—Take two pounds of mutton from the loin or the lean part of the neck, remove the skin and the fat, and cut it into small pieces about two inches square. Put the meat and the bones in a saucepan or a kettle, cover with a quart of cold water, and add a tablespoonful of rice or pearl barley; then simmer them gently for two hours, strain, and place aside to cool, when the fat is carefully skimmed off. It is served hot and seasoned with pepper and salt.

Beef Broth.—Allow one pound of meat, or meat and bone, to every quart of water. Wash the meat with a cloth in cold water and cut it into small pieces. Put the meat and the bone into a saucepan or a kettle with cold water and cook it at a low temperature for two hours. Then boil for two hours and strain through a coarse strainer. Skim as much fat as possible from the surface with a spoon and then remove the remaining small particles with a sheet of clean unsized paper drawn over the surface. Season the broth with salt and pepper and serve hot. If the broth is not needed at once, it should be set aside to cool, when the fat will rise to the top and can be easily removed.

Beef-tea.—Take a pound of lean beef, free from fat and fibrous tissue, cut it into small pieces, and place them in a fruit-jar with a good cover. Add to it a pint of cold water and stand in a moderately warm place for one hour; then let it simmer gently for two hours more, then strain and season with salt and pepper.

Bottled Beef-juice.—Take half a pound of juicy beef, remove everything except the lean, and cut it into small pieces. Put the pieces of meat in a

fruit-jar with a good cover and place it in a deep saucepan containing cold water. Heat the water gradually for one hour, but do not allow the temperature to exceed 160° F., and then strain out the juice and squeeze the meat in a meat-press or a lemon-squeezer. It is seasoned with salt and pepper, and served either hot or cold. Half a pound of meat will make about four teaspoonfuls of juice.

Broiled-beef Juice.—Take half a pound of the round or any lean portion of the beef and remove all the fat and the fibrous tissue. Put it into a wire broiler and broil over a hot fire long enough to heat it thoroughly through (from six to eight minutes). Then cut it into small pieces and squeeze out the juice with a meat-press or a lemon-squeezer. It should be served hot or cold and seasoned with pepper and salt.

Beef-juice will keep for eighteen hours in a refrigerator.

Bouillon.—First make a quart of beef broth according to the method already described, and then add a pinch each of thyme, sage, sweet marjoram, and mint, and a teaspoonful each of chopped onions and carrots. Boil all together until the broth is reduced to one pint. Strain, season with salt and pepper, and serve either very hot or cold.

Oatmeal Gruel.—Take two tablespoonfuls of oatmeal, one saltspoonful of salt, one teaspoonful of sugar, one cupful of boiling water, and one cupful of milk. Mix the oatmeal, salt, and sugar together and pour on the boiling water. Cook it in a saucepan for thirty minutes and then strain through a fine wire strainer. Put it again on the stove, add the milk, and allow it to heat just to the boiling-point. Serve it hot.

Cracker Gruel.—Take two tablespoonfuls of cracker crumbs, one saltspoonful of salt, one teaspoonful of sugar, one cupful of boiling water, and one cupful of milk. Mix the salt and sugar with the cracker crumbs, pour on the boiling water, put in the milk, and simmer it for two minutes. Do not strain.

Flour Gruel.—Take one tablespoonful of flour, one saltspoonful of salt, one teaspoonful of sugar, one cupful of boiling water, one cupful of milk, and one-half of a square inch of cinnamon. Mix the flour, salt, and sugar into a paste with a little cold water and then add the cinnamon and the boiling water. Now boil slowly for twenty minutes, then put in the milk and bring it to the boiling-point again. Strain and serve very hot.

Indian Meal Gruel.—Take two tablespoonfuls of cornmeal, one tablespoonful of flour, one teaspoonful of salt, one teaspoonful of sugar, one quart of boiling water, and one cupful of milk. Mix the cornmeal, flour, salt, and sugar into a thin paste with cold water and pour into it the boiling water. Cook it in a double boiler for at least three hours, as less time will not be long enough to prepare the gruel thoroughly, and then add the milk.

Oatmeal Water.—Put a cupful of oatmeal into two quarts of cooled boiled water and place it aside in a warm place (80° F.) for an hour and a half. Then strain it and put in a refrigerator.

Barley Water.—Put three tablespoonfuls of barley (the grain) into four cupfuls of cold water and place it aside for twelve hours. Then boil it gently for an hour and a half and strain. Season it with salt, sugar, and lemon-juice and serve hot.

Wine Whey.—Warm one cupful of milk to a little more than blood-heat (100° F.) and pour into it one-half of a cupful of sherry wine. The acid and alcohol in the wine coagulate the albumen, which is then separated from the whey by straining. If it is necessary to make the whey quickly, heat the milk to the boiling-point before adding the wine.

Toast Water.—Toast three slices of bread until they are very brown and then break them into small pieces. Put them into a bowl with a pint of

cold water and set aside to soak for an hour. Then strain through a napkin and squeeze out the liquid, to which is added a little cream and sugar. It is served cold.

Rice Water.—Put two tablespoonfuls of rice into a saucepan with a quart of boiling water and simmer it for two hours. Then strain the liquid through a fine strainer, season with salt, and serve either hot or cold. If taken cold, the addition of two tablespoonfuls of sherry, port, or Madeira wine makes a good stimulating drink when indicated.

Coffee; Tea; Cocoa.—These articles of diet are prepared and served in the ordinary way.

Manufactured Foods.—The following articles of food which are included in the list of liquid diet are accompanied with instructions giving the method of preparing them for use: (1) Valentine's meat juice. (2) Bovinine. (3) Liquid peptonoids. (4) Unfermented grape-juice. (5) Mellin's food. (6) Nestle's food. (7) Horlick's malted milk. (8) Somatose.

SOFT DIET.

The time when a soft diet may be substituted for the liquid depends entirely upon the individual case; the temperature, pulse, and condition of the wound; and the particular kind of operation. In any event the change must be gradual, first one article then another being substituted until the soft diet is fully established.

Soft diet should always be supplemented by any of the articles included in liquid diet and the patient's appetite tempted by selecting such foods as are especially agreeable to her.

The following articles are the chief forms of soft diet:

Eggs: Poached (plain or on toast); scrambled; omelet; soft-boiled.

Oysters: Raw; stewed; panned; roasted.

Bread: Stale bread; Graham bread toasted; croutons; sippets; milk-toast; buttered water toast; cream toast; dry toast; buttered dry toast; plain crackers.

Soups: Chicken; cream-of-celery; cream-of-rice; chicken panada.

Potatoes: Baked; creamed.

Sweetbreads: Creamed.

Mush: Oatmeal; farina; wheat germ; cracked wheat; hominy.

Fruit: Oranges; grapes; baked apples; stewed prunes; stewed apples.

Desserts: Wine jelly; soft or baked custard; junket or slip; cream-of-rice pudding; peach foam; cornstarch pudding; boiled rice with cream and sugar; vanilla ice-cream; rice cream; orange jelly; chicken jelly; sponge-cake and cream; barley pudding.

The following are the recipes for the preparation of those articles of diet in the above list which are not in common use:

Graham Bread.—Take one pint of milk, two tablespoonfuls of sugar, one teaspoonful of salt, one-fifth of a cake of compressed yeast, two cupfuls of white flour, and enough Graham flour to make a dough. Scald some milk, and from it measure a pint; to this add the sugar and salt. While it is cooling sift some Graham flour, and when the milk has become lukewarm, put in the yeast, which has previously been dissolved in a little water. Then add the white flour (sifted) and enough of the Graham flour to make a stiff dough, but not stiff enough to mold. Mix thoroughly and shape it into a round mass in the dish. After this follow the same directions as for water bread, letting it rise the same time and baking it in the same manner.

Croutons.—Cut a slice of bread one-third of an inch thick, butter it, and divide it into small squares. Place them in a shallow dish and put the dish in a moderate oven for fifteen minutes. When done, they should be light golden brown throughout, crisp and brittle.

Sippets.—Sippets are oblong pieces of bread delicately toasted. They are made by cutting a thin slice of bread and dividing it into small pieces one inch wide and four inches long. They may be served dry, buttered, or with panned oysters.

Buttered Water Toast.—Toast four thin slices of bread. Put a pint of hot water with half a teaspoonful of salt into a shallow pan and dip each slice of toast quickly into the water. The toast is then buttered, put in a covered dish, and served hot.

Cream Toast.—Take one pint of milk, one tablespoonful of flour, one tablespoonful of butter, one saltspoonful of salt, and several slices of bread. Make a white sauce with the milk, flour, and butter, according to the following directions: Pour the milk into a saucepan and set it on the fire to heat. Put the butter and the flour together in another saucepan; place it on the fire and stir gently until the butter melts; let them bubble together for two or three minutes. Then pour in a little milk and stir until the two are mixed; add a little more milk and stir again until it bubbles, and so continue until all the milk is in. Now add the salt and let it simmer slowly until the toast is prepared. Soak the slices of toast thoroughly in salted boiling milk, arrange them in a covered dish, and pour the cream over them.

Chicken Soup.—Thoroughly clean a good fowl. Separate it at its joints and cut into small pieces. Put the meat into a saucepan with three pints of water and stew it from two and a half to three hours. Then take out the meat, but let the liquor continue to boil and add to it one tablespoonful of rice, one tablespoonful of finely cut onions which have been fried with a bit of butter until soft, but not brown, and three peppercorns. Cut the best portions of the meat into small pieces and put them into the liquor, letting all simmer until the rice is very soft. Then take out the peppercorns and season with white pepper and celery-salt. Serve hot with croutons.

Cream of Celery Soup.—Take one stalk of celery, one pint of water, one pint of milk, one tablespoonful of butter, one tablespoonful of flour, one-half of a teaspoonful of salt, and one-half of a saltspoonful of white pepper. Wash and scrape the celery, cut it into half-inch pieces, put it into the pint of boiling water, and cook until it is very soft. When done, mash it in the water in which it was boiled and add the salt and pepper. Cook an onion in the milk and with it make a white sauce with the flour and butter; add this to the celery and strain it through a soup strainer, pressing and mashing with the back of a spoon until all but a few tough fibers of the celery are squeezed through. Then put the soup in a double boiler and heat it until it steams, when it is ready to serve.

Cream of Rice Soup.—Take one-quarter of a cupful of rice, one pint of chicken broth, one pint of cream, one teaspoonful of chopped onions, one stalk of celery, three saltspoonfuls of salt, a little white pepper, and one-half a saltspoonful of curry powder. Put the rice and the chicken broth in a saucepan to cook and simmer it slowly until the rice is very soft. This will require about two hours. Half an hour before the rice is done put the cream into a saucepan with the onion, celery, pepper, and curry and let them simmer slowly for twenty minutes. Then pour the mixture into the rice and broth and strain through a soup-strainer; add the salt and set it back on the stove to heat to the boiling-point.

Chicken Panada.—Take one cupful of chicken meat, one-half of a cupful of bread soaked in milk, one pint of chicken broth, one-half of a teaspoonful of salt, and one-quarter of a saltspoonful of pepper. Cut the chicken meat up very fine and press the bread through a coarse wire strainer. Place them both in a saucepan and add the broth, the salt, and the pepper. Boil for one minute and serve hot.

Creamed Potatoes.—Cut the potatoes into small squares, put them in an omelet pan, season them with salt and pepper, and pour in milk until they are almost covered. Then simmer gently until all the milk is absorbed. To every pint of potatoes make a pint of white sauce (see cream toast) and season it with salt and chopped parsley. After the potatoes are done pour the sauce over them and serve hot.

Creamed Sweetbreads.—Make a cream sauce with a cupful of cream, a tablespoonful of flour, and half a tablespoonful of butter. Then cut a sweetbread into half-inch squares, salt them slightly, and sprinkle a little white pepper over them. Mix equal quantities of the sweetbread and the cream sauce together and put them into porcelain patty dishes. Then sprinkle the top with buttered bread-crumbs and bake in a hot oven for ten minutes.

Wine Jelly.—Put one-fourth of a box of gelatin in a bowl with one-fourth of a cupful of cold water and let it soak for half an hour. Then pour one and one-fourth cupfuls of boiling water, in which a small piece of cinnamon and one clove have been simmering, over the softened gelatin. Add half a cupful each of sugar and sherry wine and stir until the gelatin and sugar are perfectly dissolved. Then strain through a fine napkin into a mold and put it into the refrigerator to cool. If preferred, one-quarter of a cupful of lemon juice and a tablespoonful of brandy may be substituted for the cinnamon and clove.

Soft Custard.—Take one pint of milk, the yolks of two eggs, two tablespoonfuls of sugar, and one saltspoonful of salt. Put the milk into a saucepan and place it on the stove to boil. Beat together the yolks of the eggs, the salt, and the sugar, and when the milk just reaches the boiling-point pour it in slowly, stirring until all is well mixed. Then pour the mixture into the saucepan at once and cook for three minutes, meanwhile stirring it slowly. Then strain it into a cool dish and flavor it with a teaspoonful of vanilla or sherry wine.

Baked Cup Custard.—Beat one egg thoroughly; add a flat teaspoonful of sugar, beat again and pour the mixture into a breakfast coffee-cup. Then stir in sufficient milk to fill the cup three-fourths full, place a teaspoonful of butter on the top, and grate some nutmeg over the surface. Bake in a fairly hot oven for thirty minutes and then put the cup in a refrigerator to cool.

Junket or Slip.—Put a pint of milk, a tablespoonful of sugar, and a teaspoonful of rennet into a glass pudding-dish and stir until the sugar is thoroughly dissolved. Place a cover over the dish and put it into a warm place (about 98° F.). As soon as the junket is set or becomes solid, place the dish in the refrigerator to cool, and then serve in small saucers, grating some nutmeg over the top. If preferred, brandy may be added to the rennet before it is mixed with the milk.

Cream of Rice Pudding.—Take one quart of milk, one-half a cupful of rice, two tablespoonfuls of sugar, and one saltspoonful of salt. Put the milk, rice, sugar, and salt together in a pudding-dish, stir until the sugar is dissolved, then place the dish in a pan of water and bake in a slow oven for three hours, cutting into the crust which forms on the top once during this time.

Peach Foam.—Peel and cut into small pieces three or four very ripe peaches; put them into a bowl with half a cupful of powdered sugar and the white of one egg. Then beat with a fork for half an hour until it forms a

thick, smooth, velvety cream, and serve in a small dish with or without cream.

Cornstarch Pudding.—Take one and a half tablespoonfuls of cornstarch, one tablespoonful of sugar, one saltspoonful of salt, two tablespoonfuls of cold water, and one pint of milk. Put the milk on the stove to heat. Mix in a saucepan the cornstarch, sugar, salt, and water, and when the milk begins to boil pour it in, slowly at first, stirring all the while. Then pour the mixture into a double boiler and cook for thirty minutes. At the end of that time beat one egg very light and stir it in, pouring slowly, so that it may be mixed all through the hot pudding and puff it up. Then cook for one minute, turn into individual molds, and cool. Serve with cream.

Rice Cream.—Take two tablespoonfuls of rice, two cupfuls of milk, one saltspoonful of salt, two tablespoonfuls of sugar, and two eggs. Cook the rice and the milk in a double boiler for about three hours; should the milk evaporate, restore the lost amount. When the rice is perfectly soft, press it through a coarse soup-strainer into a saucepan and place it on the fire. While it is heating, beat the eggs, sugar, and salt together until very light, and when the rice boils pour in the egg slowly, stirring gently with a spoon for three or four minutes, or until it coagulates and the whole is like a thick, soft pudding. Then remove from the fire and pour into a dish. By omitting the yolks and using only the whites of the eggs a delicate white cream is obtained.

Orange Jelly.—Take one-quarter of a box of gelatin, one-quarter of a cupful of cold water, one-half a cupful of boiling water, one-half a cupful of sugar, one cupful of orange-juice, and the juice of half a lemon. Soften the gelatin in the cold water by soaking it for half an hour; then pour in the boiling water, stirring until the gelatin is dissolved; add the sugar, orange juice, and lemon juice, in the order in which they are given, stir for a moment, and then strain the liquid through a napkin into molds and put them in a refrigerator.

Chicken Jelly.—Clean a small chicken, disjoint it, and cut the meat into small pieces; remove the fat, break or pound the bones, and put all into cold water (a pint of water for every pound of chicken). Heat the water very slowly at first, and then simmer for three or four hours or until the meat is tender. Boil down to one-half the quantity of water, strain, and remove the fat. Then clear it with an egg and season with salt, pepper, and lemon. Strain it through a fine napkin, pour into small cups, and cool.

Barley Pudding.—Take two tablespoonfuls of barley flour, one tablespoonful of sugar, one saltspoonful of salt, one cupful of boiling water, one-half of a cupful of rich milk, and the whites of three eggs. Mix the flour, sugar, and salt in a saucepan with a little cold water. When smooth and free from lumps, pour in the boiling water, slowly stirring to keep it smooth, and then set it on the fire to simmer for ten minutes, continuing the stirring until it is thick. At the end of ten minutes put in the milk and strain all into a clean saucepan through a coarse strainer, to make the consistency even. Beat the whites of the eggs until light but not stiff, and gently stir them into the pudding, making it thoroughly smooth before returning it to the fire. Cook for five minutes, stirring and folding the pudding lightly until the egg is coagulated. Then put into a china pudding-dish and serve cold with cream.

CONVALESCENT DIET.

Just as in substituting a soft for a liquid diet, the change from a soft diet to one adapted to convalescence should be gradual and tentative.

The patient must not be allowed to eat pastry, heavy puddings, highly sea-

soned or fried food, crabs, lobsters, hot or fresh bread, overcooked meats, pork, sausages, or veal.

A convalescent diet comprises the liquid and soft diets and, in addition, the following nutritious and easily assimilated articles of food:

Meats.—Rare roast beef; rare broiled tenderloin steak; rare mutton; broiled lamb or mutton chops; sweetbreads with peas.

Salisbury Meat Cake.—Cut a piece of tender rump steak about half an inch thick, place it on a clean board, and with a sharp knife scrape off all the soft part until there is nothing left but the tough, stringy fibers. Season the soft pulp with salt and pepper, make it into small flat cakes about half an inch thick, and broil them over a brisk fire for two or three minutes. Serve on thin slices of buttered toast.

Game.—Venison; partridges; pheasant; snipe; plover; reed birds; woodcock; ducks; grouse.

Fowl.—Broiled squab on toast; roasted or broiled chicken; turkey.

Fish.—Broiled fish of various kinds.

Vegetables.—Spinach; asparagus; young peas; celery; lettuce or watercress with French dressing; lima and string beans; mashed potatoes; mushrooms; onions.

Fruits.—Grape fruit; blackberries; blueberries; raspberries; peaches; pears; watermelon; cantaloupe.

NUTRITIVE ENEMATA.

Care of the Rectum.—The rectum must be kept clean by washing it out every morning with a cleansing enema in order to preserve its retaining capacity and to prevent inflammation occurring.

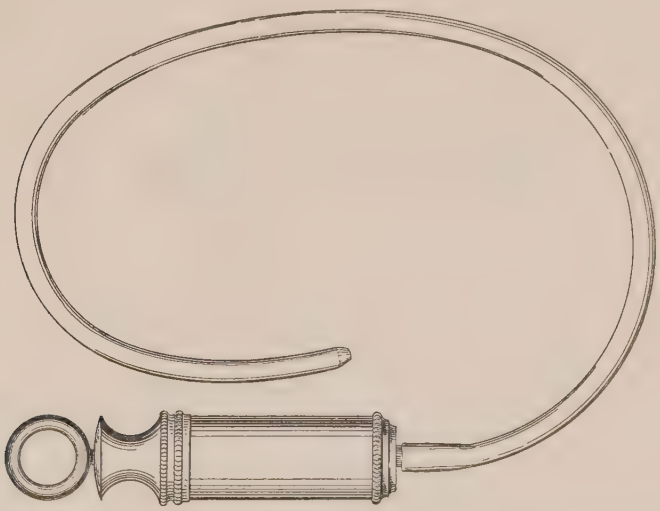


FIG. 120.—APPARATUS USED IN GIVING A NUTRITIVE ENEMA (page 116).

The following enema is useful for this purpose:

Cleansing Enema.—Take a number of scraps of Castile or any other pure soap and boil them in water until a jelly is formed. Keep this jelly in stock

in a sterile, covered fruit-jar. When required for use, put one or two tablespoonfuls of the soap jelly into a sterile quart pitcher containing a pint of boiling water and mix it thoroughly. Then reduce the temperature with cold sterile water to 105° F. and inject the mixture into the rectum.

Apparatus.—The apparatus consists of a plain rectal tube of No. 35 French scale about 20 inches in length, and a hard-rubber syringe with a capacity of four ounces.

Antisepsis.—The tube should be sterilized before using by boiling it in a 1 per cent. solution of carbonate of soda or plain water, and after giving the injection it should be thoroughly washed with warm water and soap. The syringe should be cleaned with warm water and soap before and after giving the enema. The rectal tube should be well oiled with sterile vaselin or olive oil to prevent setting up soreness of the anus.

Special Directions.—A nutritive enema must be given at a temperature of 100° F.; in quantities not exceeding four ounces; and at intervals varying from four to eight hours. In order to facilitate the formation of peptones and the absorption of albuminoids a small quantity of pepsin or pancreatin must be added to the enema; and to prevent it from being rejected when the rectum becomes more or less irritable, from 5 to 10 drops of tincture of opium are mixed with the nutritive injection. The enema should always be given high in order to facilitate its retention and bring it in contact with a large absorbing surface. The patient should therefore be placed either in the right lateral-prone or the knee-chest position to facilitate the passage of the tube.

Formulas.—The following formulas for the preparation of nutritive enemata will be found useful when it is necessary to employ rectal feeding:

No. 1. The yolk of one raw egg, brandy or whisky f℥vj, liquor pancreatis f℥ij, and beef-tea f℥iij.

No. 2. One raw egg, table salt gr. xv, brandy or whisky f℥ss, and peptonized milk f℥iij.

No. 3. Beef-juice f℥j, brandy or whisky f℥ss, cream f℥ss, and liquor pancreatis f℥ij.

No. 4. One whole raw egg, liquor pancreatis f℥ij, and beef-tea f℥iij.

No. 5. Beef-juice f℥iij, and liquor pancreatis f℥ij.

No. 6. One raw egg, and peptonized milk f℥iij.

No. 7. Table salt gr. xv, beef-juice f℥j, and peptonized milk f℥iij.

No. 8. Table salt gr. xv, one raw egg, beef-juice f℥ij, and peptonized milk f℥j.

CHAPTER X.

INDOOR EXERCISES.

The importance of outdoor exercise in maintaining the general health and developing the physique is being more and more appreciated at the present day, and the interest which is now taken in golf, tennis, riding, and other forms of recreation is producing a type of women who have healthy bodies and vigorous organs. The beneficial effect of indoor exercises either as a supplement to outdoor exercise or as a substitute for it in women of limited means is frequently overlooked by the profession, and the benefit which may be derived from this

Fig. 121.

Fig. 122.

Fig. 121 Shows Incorrect Posture and Relaxation of the Abdominal Walls; Fig. 122 Shows Correct Posture and Contracted Abdominal Walls (page 118).
Note the difference in the shape of the abdomen.

therapeutic means is therefore not taken advantage of in many cases in which it is distinctly indicated.

Indoor exercises are a useful adjunct in the treatment of certain gynecologic affections, and also in the technic of hydrotherapy, and I shall limit the discussion of the subject to the consideration of these indications.

The equilibrium of the pelvic organs and the condition of the circulation depend largely upon the strength of the abdominal and thoracic muscles and the capacity of the lungs. As long as the retentive power of the abdomen is normal the uterus and its appendages maintain their position and there is no tendency to pelvic congestion. When, however, the abdominal walls become relaxed and

the action of the diaphragm is restricted by shallow or inefficient breathing, the pelvic organs become displaced and passive congestion results. The effect of indoor exercises counteracts this tendency by strengthening the abdominal and chest muscles and increasing the breathing capacity of the lungs. The movements which are used in these exercises produce decided results even in women who take outdoor exercise, because they are designed to have a special effect upon certain muscles which control the act of respiration and preserve the integrity of the retentive power of the abdomen. In early womanhood the abdominal walls are tense and well developed and they hold the viscera well back in position. Later on in life, however, the muscles become relaxed and more or less atrophied from disuse or want of exercise, and the abdominal organs cause the abdomen to protrude, forming what is commonly called a "pot belly." Eventually fat accumulates in the parietes and the omentum and a well-marked pendulous abdomen results which no longer supports the pelvic and abdominal organs. The bad results which are caused by such an abdomen are not due to the fat which it contains but to the relaxed and atrophied condition of the muscles, and consequently we must direct the treatment to the relief of the latter condition (Figs. 121 and 122).

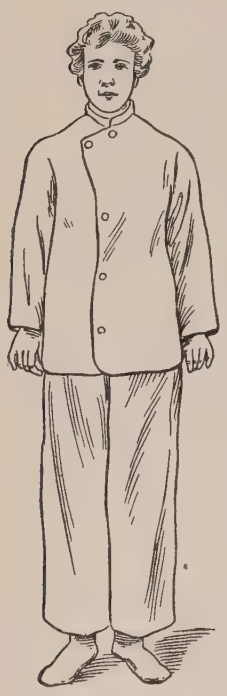


FIG. 123.—PROPER COSTUME FOR EXERCISES—PAJAMAS AND STOCKINGS.

A mistake is often made in treating obese women suffering with pelvic congestion or a uterine displacement by ignoring the atrophied state of the muscles and directing the treatment solely to the reduction of the fat. Under proper dietetic treatment these patients naturally lose considerable weight and their waist measurement is decidedly lessened, but they derive no local benefit whatever because the retentive power of the abdomen has not been increased in the slightest degree.

Indoor exercises also play an important part in the technic of hydrotherapy, and they are often employed with decided advantage. For example, some women cannot take a cold bath in the morning before breakfast because it is not followed by reaction, and consequently when this variety of bath is clearly indicated it cannot be employed under the circumstances. The reason for this is that the circulation is sluggish immediately after getting up in the morning, and unless a woman is naturally very strong and robust she cannot stand the shock produced by the cold water. If, however, five or ten minutes are first devoted to active movements of the body the action of the heart and lungs is accelerated, the blood-pressure is increased, the surface of the skin is covered with a gentle perspiration, and a cold plunge is now quickly followed by a rapid and healthy reaction.

The following rules must be strictly adhered to in taking indoor exercises:

Rule 1.—Have the windows down from the top so that there will be plenty of fresh air in the room without causing a draft.

Rule 2.—Dress in pajamas and stockings. There must be no constriction about the waist, the hips, the chest, or the neck.

Rule 3.—The exercises should be taken in the morning before breakfast and at night before retiring. The stomach should not contain food and the bladder should be emptied before beginning the exercises.

Rule 4.—The time devoted to the exercises should be from ten to fifteen minutes, or longer if indicated, and the number and character of the individual movements should be regulated according to the general condition of the patient.

Rule 5.—Instruct the patient to perform the exercises regularly and never to omit them because she feels tired or lazy. The patient should not become discouraged too soon, as it may take a long time to attain the desired results.

Rule 6.—Concentrate the attention upon the exercise and the action of the muscles involved, otherwise the best results cannot be attained.

Rule 7.—After each exercise there should be a brief period of absolute muscular relaxation, and if the breathing or the heart's action becomes hurried a rest must be taken until they calm down again. Never exercise too rapidly or

FIG. 124.

FIG. 125.

EXERCISE NO. 1. **Deep Breathing.**

Showing the position before and during the exercise. Note the elevation of the shoulders and chest in figure 125.

the correct position of the body and the proper play of the muscles will be disturbed.

Rule 8.—After exercising in the morning take a cold sponge, spray, or plunge bath, and dry the skin vigorously with a coarse towel. After exercising at night take a full warm bath and get into bed at once.

The following exercises should be taken according to the foregoing rules in the order given, and the number and character of the movements should be regulated, as stated above, by the strength of the patient.

Exercise 1. Deep Breathing.—Stand erect with the hands resting on the hips and inhale slowly until the lungs and chest are fully expanded. Now hold the breath and contract the abdominal muscles for a few seconds and then

exhale gradually until the air is completely expelled. Breathe through the nose and repeat the exercise four times in a minute.

Exercise 2. Abdominal Contractions.—Stand erect with the hands resting on the hips (Fig. 124) and alternately contract and relax the abdominal muscles.

Exercise 3. Trunk Bending Backward.—Stand erect with the hands resting on the hips (Fig. 124), and after taking a full breath and contracting the abdominal muscles bend the body slowly backward; then gradually straighten up again and exhale the air from the lungs. Rest ten seconds and then repeat the movement.

FIG. 126.—EXERCISE NO. 2. **Abdominal Contractions.**
The dotted line shows the movements of the abdominal wall.

FIG. 127.—EXERCISE NO. 3. **Trunk Bending Backward.**

Exercise 4. Trunk Bending Forward.—Stand erect with the arms raised as high as possible above the head, the palms of the hands turned forward and the thumbs loosely interlocked. Then take a full breath, contract the abdominal muscles, and bend the body forward without bending the knees until the tips of the fingers or the palms of the hands touch the floor. Now return to the original position, raise the heels from the floor, and exhale the air from the lungs as the arms are slowly lowered to the sides of the body. Rest ten seconds and then repeat the movements.

In bending the body the arms and hands must be kept extended out in front and the back gradually bowed as the trunk falls forward. At first the patient

may be unable to touch the floor with the tips of the fingers, but after using the exercise for some time the spinal column becomes flexible and it can be accomplished without difficulty.

Exercise 5. Trunk Bending Antero-laterally.—The movements are the same as in No. 4, except that the body is bent laterally instead of directly forward and the tips of the fingers touch the floor first on one side and then on the other (Fig. 130).

Exercise 6. Trunk Bending Sideways.—Stand erect with the hands resting on the hips (Fig. 124). Then take a full breath, contract the abdominal

FIG. 128.

FIG. 129.

EXERCISE No. 4. Trunk Bending Forward.

muscles, and bend the trunk alternately several times toward the right and left; the head should follow the movements of the body. Rest ten seconds and repeat the exercise (Fig. 131).

Exercise 7. Trunk Twisting.—Stand erect with the heels close together, the hands resting on the hips (Fig. 124) and the thighs and legs rigid. Then take a full breath, contract the abdominal muscles, and twist the trunk several times from one side to the other as far as possible; the head should follow the movements of the body. Rest ten seconds and then repeat the exercise (Fig. 132).

Exercise 8. Squatting.—Stand erect with the hands resting on the hips and the heels separated about four inches. Take a full breath, contract the abdominal muscles, and slowly assume a sitting or crouching position with the buttocks close to the heels. Then straighten up again and exhale the air from the lungs; rest ten seconds and repeat the movements.

FIG. 130.—EXERCISE NO. 5. **Trunk Bending Antero-laterally** (page 121).

Exercise 9. Trunk Raising.—Lie flat on the floor with the legs extended, the feet close together, and the hands resting on the hips. Take a full breath, contract the abdominal muscles, and raise the trunk slowly until a sitting position is attained. Then gradually return to the original position and exhale the air from the lungs; rest ten seconds and repeat the movements.

Until the abdominal muscles become accustomed to the exercise the patient should steady her legs by placing the feet under a bureau or a couch. During the movements the shoulders should be thrown well back so as to expand the chest and keep the spine straight.

Exercise 10. Raising the Legs.—Lie flat on the floor, the feet close

FIG. 131.—EXERCISE NO. 6. **Trunk Bending Sideways** (page 121).

FIG. 132.—EXERCISE NO. 7. **Trunk Twisting** (page 121).

FIG. 133.

FIG. 134.

EXERCISE NO. 8. **Squatting.**

FIG. 135.

FIG. 136.

EXERCISE NO. 9. **Trunk Raising.**

together and the hands resting on the hips. Take a full breath, contract the abdominal muscles, and slowly raise the legs straight up to a right angle with the trunk. Then gradually return to the original position and exhale the air from the lungs; rest ten seconds and repeat the movement.

If the patient is unable to raise both legs at the same time, they should be

Fig. 137.

Fig. 138.
Exercise No. 10. **Raising the Legs.**

elevated alternately until the muscles become strong enough to accomplish the regular movement.

Exercise 11. The Dip Movement.—Lie on the stomach and chest, the palms of the hands flat on the floor close to the sides of the body, the toes somewhat bent, and the feet close together. Take a full breath, contract the abdominal

muscles, and raise the body on the hands and toes by slowly extending the arms. Then lower the body back to the original position again and exhale the air from the lungs. Rest ten seconds and repeat the movement.

FIG. 130.

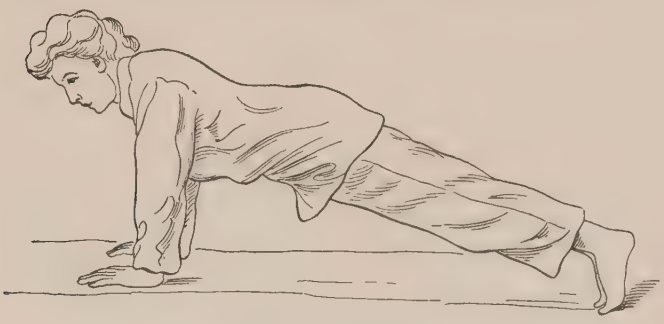


FIG. 140.
EXERCISE NO. 11. **The Dip Movement.**

Exercise 12. Raising the Trunk Backward.—Lie on the stomach and chest, the hands placed on the hips, the legs extended, and the chest resting on the floor. Then take a full breath, contract the abdominal muscles, and slowly

FIG. 141.

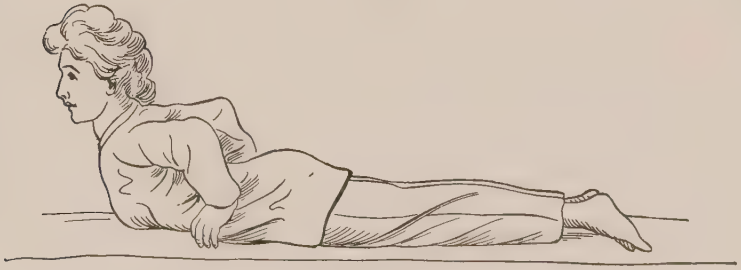


FIG. 142.
EXERCISE NO. 12. **Raising the Trunk Backward.**

raise the head and trunk as far as possible. Then lower the body back to the original position and exhale the air from the lungs. Rest ten seconds and repeat the movement.

Special Directions.—The beneficial results which should be derived from the exercises cannot be obtained unless the technic is thoroughly carried out and the rules strictly adhered to. It is especially important, except in exercise No. 2, to have the abdominal muscles firmly contracted and the lungs filled with air while the various movements are being made, otherwise the muscular tone of the abdomen will not be restored and the breathing capacity will not be increased.

The effects produced by the exercises are greatly increased if the patient breathes deeply and keeps the abdominal muscles moderately contracted when walking. At first this is rather difficult to accomplish, but gradually as the muscles regain their tone the effort becomes less marked, and in time the abdominal walls contract naturally.

CHAPTER XI.

SALINE INJECTIONS.

Preparation of the Solution.—A normal salt solution is composed of one drachm (0.78 per cent.) of sodium chlorid to a pint of distilled water.

It is prepared and kept ready for use as follows: Six glass flasks (each having a capacity of two quarts, about 2000 cc.) are filled with distilled water, and to each is added four drachms of *chemically pure sodium chlorid*, which is now prepared by manufacturing chemists and sold in drug-shops.

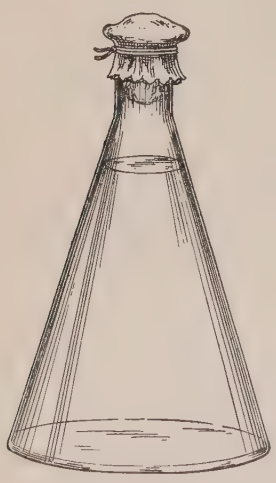


FIG. 143.—GLASS FLASK CONTAINING NORMAL SALT SOLUTION AND PLUGGED WITH COTTON BATTING.

Each flask is then plugged with cotton batting and its rim protected with a layer of the same material, which in turn is covered with a piece of gauze, and the whole secured by a string tied around the neck of the bottle.

The flasks are then placed in the high-pressure steam sterilizer and their contents sterilized as follows: The steam is turned into the heating coils and the outlet valve of the sterilizer left open. As soon as a large volume of steam escapes from the valve, which shows that all the air has been driven out, it is shut off and the pressure in the sterilizer allowed to reach fifteen pounds. At the end of five minutes the steam going to the heating coils is shut off and the pressure allowed to gradually fall to zero by the *simple process of condensation or cooling*, which occurs in about thirty-five minutes. From tests made by the author with a self-registering thermometer the saline solution is subjected to a temperature of 241° F. It is necessary to bear in mind when the steam is turned off at the end of five minutes that if the exhaust valve is opened the sudden release of the pressure will cause the solution in the flasks to immediately vaporize and their contents will be lost. On the other hand, if the pressure is allowed to gradually fall to zero by cooling, vaporization does not take place, and but little, if any, of the solution is lost during the process of sterilization.

When the pressure falls to zero, the flasks are removed from the sterilizer and placed in the storage case until ready for use.

Preparations at the Time of Operation.—At the time of an operation or whenever a saline injection is required the requisite number of flasks are taken out of the storage case and half of them placed in the instrument sterilizer and immersed up to their necks in water. The steam is then turned into the heating coils and the water boiled for ten minutes, which raises the temperature of the saline solution in the flasks to 196° F. (actual test made by the author).

We have now two sets of flasks, one of which contains cold and the other hot salt solution, which are ready to be mixed in the injection reservoir when needed.

When everything is prepared to give the injection, the string around the neck of a hot and a cold flask is cut with scissors and the protecting cap and plug of gauze and cotton batting removed. A quart of the cold solution is then poured directly from the flask into the glass reservoir and the hot solution added until the thermometer registers the proper temperature.

In removing the protecting caps from the flasks care must be taken not to allow the free edges of the gauze and cotton batting to come in contact with the mouth of the bottles, otherwise they will become contaminated and infect the solution when it is poured out.

Thermometer.—It is absolutely necessary to use a thermometer in order to determine with accuracy the temperature of the solution in the glass reservoir. The instrument is sterilized by placing it for ten minutes in a 5 per cent. aqueous solution of formalin and rinsing it with sterile water.

The combination thermometer is the best instrument I know of for the purpose, and it is kept in the glass reservoir to register the temperature of the solution while the injection is being given. Before sterilizing the thermometer both ends are protected with rubber tubing to keep it from knocking against the sides of the reservoir and breaking (Figs. 144 and 145).

Temperature of the Solution.—The temperature will vary according to the route by which the solution is thrown into the circulation, and it must be constantly registered by the thermometer in the reservoir.

There is, on an average, a loss of from five to ten degrees of heat in the solution before it reaches the cannula, needle, or rectal tube when the ordinary apparatus is used for administering saline injections, and the temperature in the reservoir must therefore be regulated to offset this reduction and deliver the fluid at the proper temperature into the body. With a properly constructed apparatus, however, the loss of heat is reduced to a minimum and varies between one and two degrees according to the route by which the injection enters the circulation. The loss of heat is influenced by the temperature of the room, the length and calibre of the tube, and the size of the cannula, needle, or rectal attachment. There is less loss of heat in a tube of large caliber than in a small one, and in a short than in a long tube. It is a mistake therefore to have the tube over six feet in length, as the reservoir should never be elevated higher than that distance above the patient and any additional tubing is not only unnecessary but it makes it more difficult to sustain the proper temperature of the solution. There is always considerable loss of heat when a small needle is used, as the solution flows so slowly through the tube that the temperature of the room has more effect upon it than when the caliber is large.

One of the most important factors in the technic of giving a normal salt injection is to keep the solution in the reservoir at the proper temperature during the entire procedure. This is easily accomplished by watching the thermometer in the reservoir and adding a small quantity of hot solution when the temperature begins to drop. When the reservoir needs refilling the operator must stop the flow by pinching the tube while the assistant mixes the solution at the required temperature.

General Indications.—Injections of normal salt solution are indicated in the treatment or prevention of shock, hemorrhage before, during, and after operation, sepsis, uremia, and renal insufficiency. A saline injection must never be given in cases of hemorrhage until the bleeding vessel is found and tied. It should therefore not be employed in the treatment of a hemorrhage following an abdominal operation or a ruptured ectopic gestation sac until the operator actually starts to open the abdomen and search for the ruptured vessel.

FIG. 144.—COMBINATION THERMOMETER (page 127).

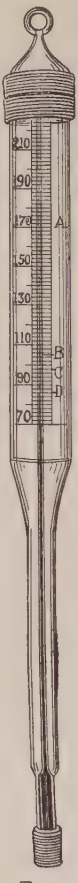


FIG. 145.—RUBBER TUBING PLACED ON BOTH ENDS OF THE THERMOMETER TO PROTECT IT FROM INJURY (page 127).

Routes of Entrance into the Circulation.—A saline solution may reach the general circulation through (1) a *vein*, (2) the *subcutaneous tissues*, and (3) the *lower bowel*.

In giving injections by these routes the first is called an intravenous injection, the second hypodermoclysis, and the third enteroclysis.

INTRAVENOUS INJECTIONS.

Indications.—This is the quickest and most effective route, and should be the method of choice in all cases in which a rapid or profound impression is required.

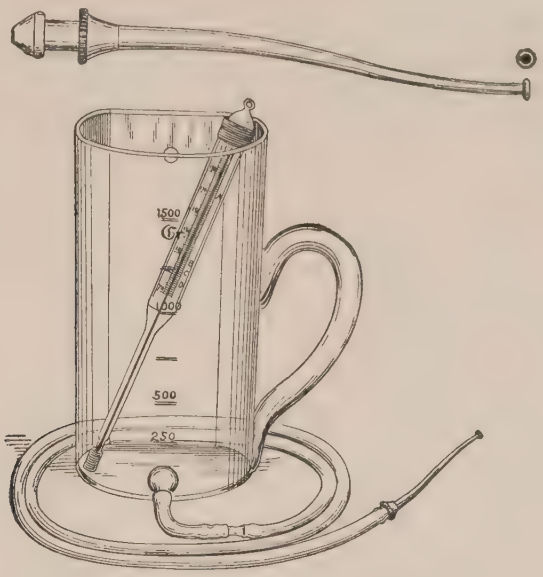


FIG. 146.—ASHTON'S APPARATUS FOR GIVING INTRAVENOUS INJECTIONS.
The actual size and caliber of Shober's cannula are shown in the upper illustration.

It is supplemented, as a rule, by either enteroclysis or hypodermoclysis or both.

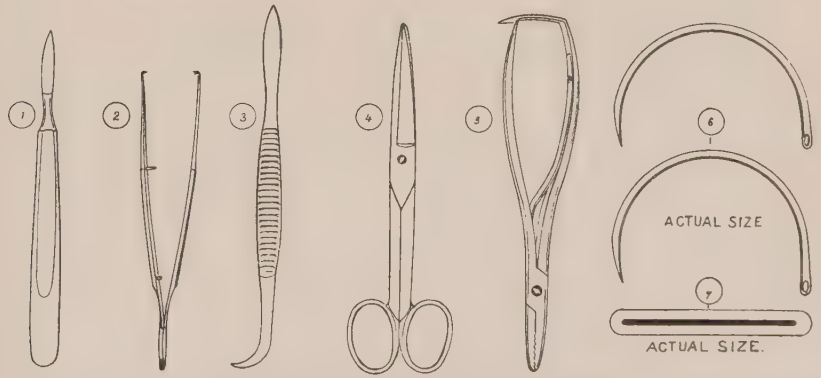


FIG. 147.—INSTRUMENTS, NEEDLES, AND SUTURE MATERIAL, USED FOR OPENING AND CLOSING THE VEIN IN GIVING AN INTRAVENOUS SALINE INJECTION (page 130).

Apparatus.—This consists of a graduated glass reservoir, a thermometer, six feet of rubber tubing (caliber $\frac{1}{4}$ of an inch), and Shober's metal cannula.

An ordinary fountain syringe may be used and the cannula attached to it if a graduated reservoir is not at hand.

Instruments.—(1) Scalpel; (2) tissue forceps; (3) dry dissector; (4) straight scissors; (5) Hagedorn needle-holder; (6) two small full-curved Hagedorn needles; (7) plain cumol catgut, No. 2, three envelopes (Fig. 147).

Antisepsis.—The apparatus is sterilized in the high-pressure steam or instrument sterilizer. The hands of the operator are carefully prepared by means of mechanic sterilization (p. 814) and the bend of the patient's elbow is scrubbed with warm water and soap; then washed with a solution of corrosive sublimate (1 to 1000); and finally douched with plain sterile water.

Temperature.—The solution in the reservoir must be kept at a constant temperature of 105° F., which gives an average of 103° F. or more at the mouth of the cannula.

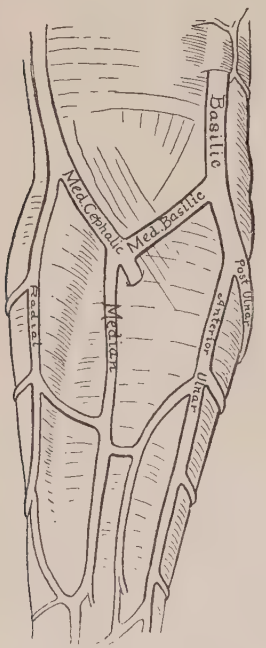


Fig. 148.—Superficial Veins of the Arm and Forearm.

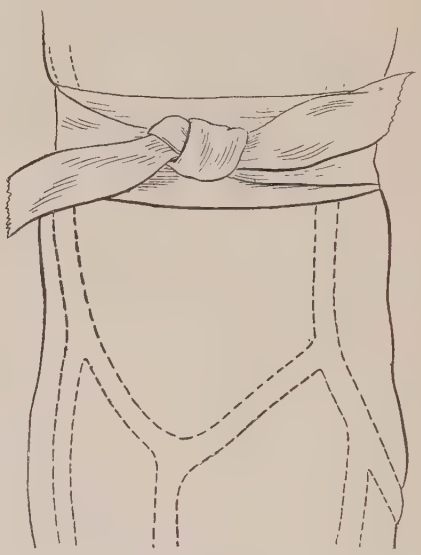


Fig. 149.—Intravenous Saline Injection. First Step.

The arm constricted by a bandage and the veins of the forearm distended.

Rapidity.—The reservoir should be held from two to six feet above the patient. At six feet the solution flows into the vein at the rate of four ounces every minute, or about one quart in eight minutes. The speed of the flow should be regulated by the strength of the pulse, and if it is weak the reservoir should be held closer to the patient so that the injection will not enter the vein too rapidly.

Quantity.—The quantity of a single injection varies from one pint to six quarts, according to the indications in an individual case, and it may be repeated, if necessary, in the vein of the other arm. Usually, however, an intravenous injection is followed later on by either enteroclysis or hypodermoclysis if the necessity for a rapid or profound impression does not continue.

Local Anesthesia.—Before dissecting out the vein the skin should be anesthetized by a hypodermic injection of cocain or by freezing with ethyl chlorid or ice.

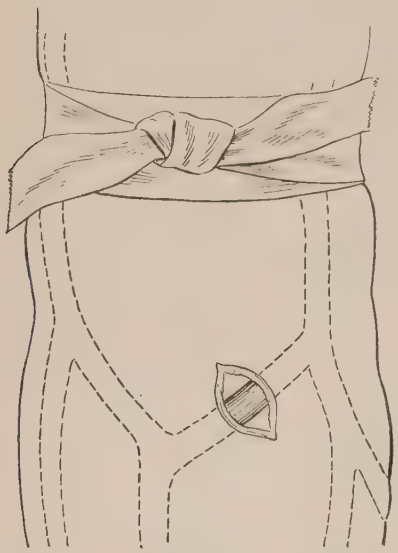


FIG. 150.—INTRAVENOUS SALINE INJECTION. Second Step.

The most prominent vein exposed by a transverse incision.

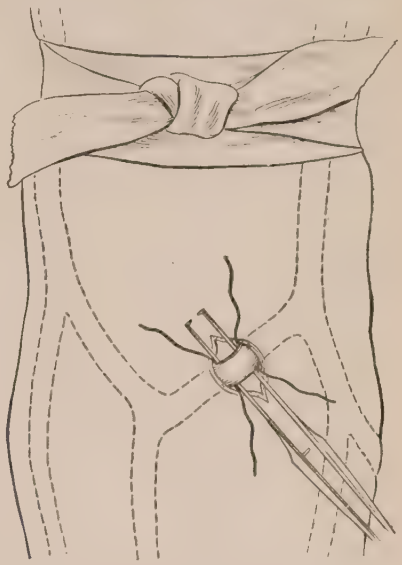


FIG. 151.—INTRAVENOUS SALINE INJECTION. Third Step (page 132).

The vein dissected out and tissue forceps placed beneath it; the two catgut ligatures are in position.

Operation.—First Step.—A bandage is wrapped tightly twice around the arm above the elbow and securely tied in order to compress the veins and make them prominent.

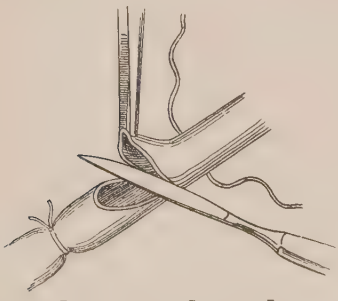


FIG. 152.—INTRAVENOUS SALINE INJECTION. Fourth Step (page 132).

The distal ligature tied, the forceps withdrawn, and a deep oblique cut made across the vein.

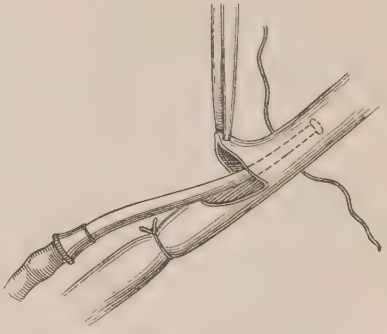


FIG. 153.—INTRAVENOUS SALINE INJECTION. Fifth Step (page 132).

Shows the cannula being introduced into the vein while the incision is held open with forceps.

Second Step.—An incision is made directly across the most prominent vein that presents itself at or near the bend of the elbow and the vessel exposed.

The incision exposing the vein should not be made parallel to its border, as the vessel slips to one side and it is difficult to dissect out.

Third Step.—The vein is carefully dissected out with the tissue forceps and dry dissector and one inch of its length exposed. The forceps are then passed under the vein and two catgut ligatures placed beneath it (Fig. 151).

Fourth Step.—The distal portion of the vein is tied with the lower ligature and the tissue forceps withdrawn. The middle of the exposed portion of the vein is then seized with the tissue forceps and put on the stretch, and at the same time a deep oblique cut upward is made across the vessel with the scalpel, exposing its lumen (Fig. 152).

Fifth Step.—The operator allows some of the solution to flow through the cannula in order to expel the air and get rid of the fluid which has become cold in the rubber tube. He then inserts the cannula through the opening in the vein

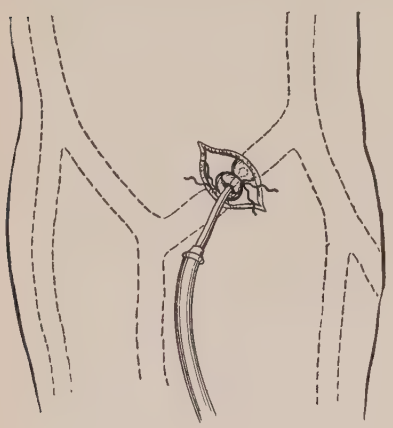


FIG. 154.—INTRAVENOUS SALINE INJECTION. **Fifth Step.**
The cannula introduced into the vein and secured in position by the upper ligature.

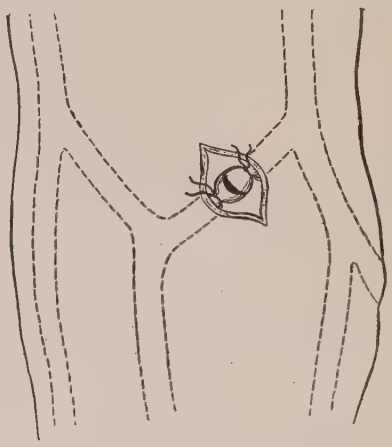


FIG. 155.—INTRAVENOUS SALINE INJECTION. **Seventh Step.**
The cannula withdrawn and the proximal end of the vein ligated.

while the solution is flowing through it, and secures both the cannula and vein by tying the second ligature tightly around them (Figs. 153 and 154).

Sixth Step.—The compression above the elbow is removed and the solution allowed to flow directly into the circulation.

During the injection the assistant constantly watches the reservoir and notes the temperature and quantity of the solution.

Seventh Step.—When the required amount of solution has been used, the second ligature is cut and the cannula withdrawn. A catgut ligature is then placed under the vein and its proximal end securely tied.

The wound is then closed with two or three catgut sutures and dressed with sterile gauze which is held in position with a few turns of a roller bandage or a strip of Z.O. plaster.

HYPODERMOCLYSIS.

Indications.—This is a comparatively slow method of introducing a saline solution into the circulation and should be employed only as a supplement to an intravenous injection or in cases in which time is not an important element. It is therefore indicated in cases of slight shock or hemorrhage in which a delay of twenty minutes to half an hour is not injurious to the patient. It is contraindicated in profound shock, excessive hemorrhage, uremia, and in

marked renal insufficiency except as an adjunct to the intravenous route. If the heart's action is very rapid and weak, the absorption is so slow as to render hypodermoclysis practically ineffective and more or less useless.

Apparatus.—This consists of a graduated glass reservoir, a thermometer, six feet of rubber tubing (caliber ¼ of an inch), and a large aspirating needle.

If a graduated reservoir is not at hand, the aspirating needle can be attached to an ordinary fountain syringe.

Antisepsis.—The same antiseptic preparations are carried out as for an

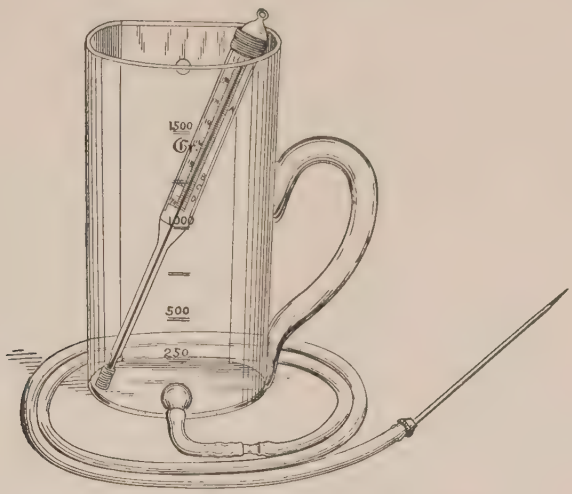


Fig. 156.—Ashton's Apparatus for Giving Hypodermoclysis.

intravenous injection (see p. 130). Suppuration should not occur in the tissues unless the technic of the operation is imperfect, except, however, in cases of sepsis, in which it sometimes results despite every precaution that is taken to guard against the accident.

Temperature.—The solution in the reservoir must be kept at a constant temperature of 113° F., which gives an average of 110° F. or more at the mouth of the needle. A high temperature causes quick stimulation and promotes rapid absorption.

Fig. 157.—Actual Size of the Needle Used in Hypodermoclysis.

Rapidity.—The reservoir should be held six feet above the patient. At this height the solution passes into the subcutaneous tissues at the rate of about one pint in from fifteen to twenty minutes.

Quantity.—The quantity of the solution injected into the tissues depends upon the indications in an individual case. Frequently repeated injections of small amounts are more effective, as a rule, than a single large injection. From ten ounces to one pint are usually given every six hours, and in some instances it may be necessary to inject at frequent intervals as much as three or four quarts of the solution within twenty-four hours.

Local Anesthesia.—The skin should be anesthetized by a hypodermic injection of cocain, or by freezing with ethyl chlorid or ice.

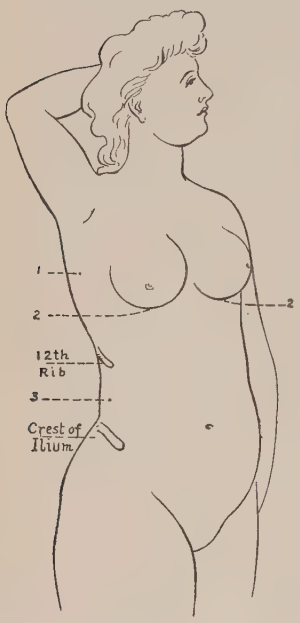


FIG. 158.—SITUATIONS IN WHICH HYPODERMOCLYSIS IS GIVEN.

Situation.—The injection must be given where there is plenty of underlying loose cellular tissue, and under no circumstances should the fluid be injected into a muscle. The best situations are (1) at the sides of the chest about three inches below the axilla, (2) under one or both breasts, and (3) between the crest of the ilium and the twelfth rib.

Operation.—The operator first allows some of the solution to flow through the needle in order to expel the air-bubbles and get rid of the fluid which has become cold in the tube. He then thrusts the needle deeply and obliquely into the cellular tissue while the solution is flowing through it, and as the tissues become distended gently strokes or rubs the skin to facilitate the absorption of the fluid. The assistant constantly watches the reservoir and notes the temperature and quantity of the solution. When the required amount of solution has been thrown into the tissues, the aspirating needle is withdrawn and the operator places his finger over the site of the puncture to prevent the fluid from escaping. The wound is then dressed with a layer of sterile gauze covered with collodion.

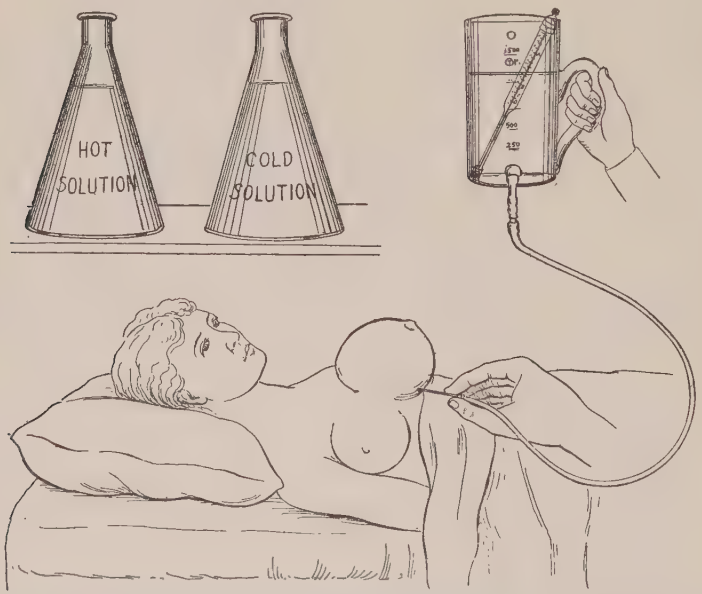


FIG. 159.—GIVING HYPODERMOCLYSIS UNDER THE LEFT BREAST.
Note that the flasks containing hot and cold saline solution for keeping the fluid in the reservoir at a constant temperature are placed near the patient.

If the flow of the solution is too slow or it ceases altogether, it can be remedied by stripping the tube with the fingers from above downward or by rotating the needle or pushing it in further and then withdrawing it a little or changing the position of its point.

ENTEROCLYSIS.

Indications.—This method is frequently employed as an adjunct to intravenous injections and hypodermoclysis. It is much less effective than either of the other two methods and is never used alone when a decided and rapid action is required. It is often given, however, as a routine practice after abdominal operations before the patient leaves the operating table in order to lessen the desire for water during the first twenty-four hours.

Apparatus.—This consists of a graduated glass reservoir, a thermometer, six feet of rubber tubing (caliber ¼ of an inch), and a rectal tube twenty inches long (No. 35 French scale). If a graduated reservoir is not at hand, the rectal tube can be attached to a fountain syringe.

Antisepsis.—The apparatus is sterilized in the high-pressure steam or instrument sterilizer.

Temperature. — The solution in the reservoir must be kept at a constant temperature of 111° F., which gives an average of about 110° at the mouth of the rectal tube, as there is less loss of heat than in the other methods on account of the rapidity of the flow.

Rapidity. — The reservoir should be held four feet above the patient.

Quantity.—This depends upon the indications in an individual case. Usually, however, from one pint to one quart is injected every six hours.

Situation. — The injection should be given high up in the bowel or it will be expelled, as the rectum itself will not retain over six or eight ounces.

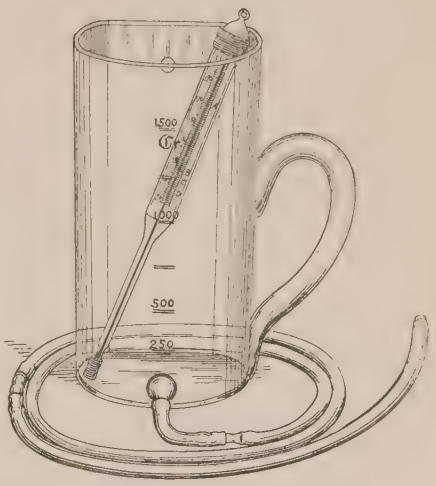


Fig. 160.—Ashton's Apparatus for Giving Enteroclysis.

Position of the Patient.—The patient should be placed on her side in the right lateral-prone position and the hips elevated on a pillow. If, however, she cannot be moved from the dorsal recumbent position, the injection can readily be given by elevating the hips and drawing up the knees.

Operation.—The operator first allows some of the solution to flow through the rectal tube in order to expel the air and get rid of the fluid that has become cold in the tubing. He then stops the flow by pinching the tubing, and after lubricating the rectal tube with sterilized vaselin or olive oil, introduces it slowly into the rectum beyond the sigmoid flexure. The required amount of solution is then allowed to flow gradually into the bowel, after which the rectal tube is withdrawn and the patient placed in her former position.

The assistant constantly watches the reservoir and notes the temperature and quantity of the solution.

CHAPTER XII.

THE CAUSES OF DISEASES PECULIAR TO WOMEN.

The causes of the diseases peculiar to women are classified as follows:

1. Anatomic Causes.
2. Hereditary and Congenital Causes.
3. Civilization.
4. Social Conditions.
5. Education.
6. Unhygienic Conditions.
7. Childbirth.
8. Sexual Relations.
9. Criminal Abortions.
10. Venereal Diseases.
11. Accidental Infections and Traumatisms.
12. The Different Periods of Life.

Anatomic Causes.—The relations of the uterus and its appendages with the abdominal cavity and its contents, as well as the fact that in the female there is a direct external communication with the peritoneum through the Fallopian tubes, constitute important factors in the etiology of diseases peculiar to women. Thus, in cases of general and local peritonitis having their origin in causes common to both sexes, as in appendicitis, intestinal obstruction, etc., the effects are distinctly different upon the female pelvis. The inflammatory exudates not only cause intestinal adhesions, but they may also result in distortions and fixations of the uterus and its appendages, producing many chronic subjective symptoms and the destruction of the functional activity of the pelvic organs. Again, the direct communication with the peritoneum, by means of which various septic and specific infections gain access, results in the production of certain diseases which, so far as their origin is concerned, are peculiar to women. Thus, for example, gonorrheal, tubercular, and other forms of infection may be deposited upon the vulva, in the vagina, or in the uterus and pass directly through the Fallopian tubes into the general abdominal cavity. The anatomic relations existing between the genital and urinary organs render the latter especially liable to diseased conditions dependent upon infection and traumatism. The shortness and dilatability of the urethra and its comparative freedom from stricture lessen the chances of a vesical calculus forming and exempt the urethral canal from many of the organic affections common to the male.

Hereditary and Congenital Causes.—The inherited tendency to tuberculosis and malignant affections is often a predisposing cause of disease, and women of a strumous diathesis are found to be susceptible to certain functional and organic disorders, such as dysmenorrhea, uterine displacements, and leukorrheal discharges. A morbid proliferation of embryonal cells is the cause of dermoid and parovarian cystoma, and also of cysts of Gärtner's duct, while any interference with the vitality and development of these cells by the infection of the fetus with syphilis, smallpox, measles, or scarlet fever may cause an arrest in the normal growth of the organs of generation without influencing in any way the general physique of the individual. Again, congenital influences which produce various malformations and anomalies of the female genito-urinary organs are simply attempts on the part of nature to return to a former type in the process of evolution. And, finally, a woman may be sexually weak as the result of inherited defects in the vigor of her genital organs. "Such defective heredity

is probably not generally immediate, but is gradual in its declension, generally on the maternal side, tending by continuous degeneration to induce in the progeny feeble sexual formation, frequently in the uterus. Thus the first stage may be found in a woman of deficient sexual appetite, having a uterus of moderate development, but contracted at its opening, which may be lacerated in her first confinement so, perhaps, as to prevent further conception. The child, cold-mannered, unsympathetic, and egoistic, with a feebly developed uterus and disgust at marital rights, becomes pregnant only by chance—it may be, long after marriage, or after successful operation; or, with a congenitally contracted though permeable upper vagina, closed hymen, or a tendency to the infantile pelvis with absence of sexual appetite, she becomes the mother of one child, who has a yet feebler unimpregnable uterus and atrophied ovaries, with deficient catamenial discharge and a premature menopause; or more marked abnormality may occur, and the woman be sterile" (Playfair).

Civilization.—The natural muscular strength and power to resist disease is greater in women belonging to savage tribes. In these races there is but little, if any, difference between the endurance of the male and the female, but as we ascend in the scale of intelligence and civilization, leaving the natural for a more artificial life, the contrast becomes marked, and among highly civilized people the male is by far the most powerful. Again, among savage races there is less traumatism during labor, as the children have small heads and consequently many of the immediate as well as the remote conditions dependent upon confinement are less frequently seen.

Social Condition.—There is a marked difference between working-women and women of the higher grades of society as to the frequency of various genito-urinary diseases. The lower classes receive less skilful attention during and after confinement, consequently septic infection is comparatively frequent and traumatisms occur more often and are either improperly repaired or neglected altogether. The higher classes, on the other hand, suffer more from neurasthenic conditions and various subjective symptoms which are more or less dependent upon their environment and habits of life. Furthermore, women of the lower classes are affected less by the diseases from which they suffer, and it is not uncommon to find them attending to duties and labors which are consequent to bringing up a large family, while suffering from local conditions which would make an invalid of a woman in the higher walks of life. Finally, certain occupations are likely to result in pelvic diseases, and we find that women who work in factories or stores where they are required to stand continuously for hours at a time frequently suffer from uterine displacements, while those who use the sewing-machine as a means of support are very apt eventually to develop portal and pelvic congestion. Occupations requiring heavy lifting cause retrodisplacement and prolapse of the uterus, especially in women who have borne children.

Education.—Our modern system of education has a decidedly injurious influence upon the general and sexual strength of women. Too little attention is paid to the development of the physique and the general health in our efforts to give young girls a polished education. There is no attempt upon the part of parents or educators to regulate the amount or character of mental work to suit the health and temperament of the individual, and no consideration is given to the necessity for special care and attention at the time of puberty and during the menstrual periods, when nature demands physical and mental rest. Young girls are sent to school or to college and subjected daily to long hours of study, in cramped positions and in badly ventilated class-rooms, regardless of their age or physical condition or the demands of their sexual development. "In one word, it is to the present cramming and high-pressure system of education,

together with its environment, that I attribute much of the menstrual derangements, the sterility, and the infecundity of our women, the absence of sexual feeling, the aversion to maternity, the too often lingering convalescence from a first labor, which is frequently the only one, and the very common inability to suckle their offspring. From this cause come most of my unmarried patients with nerve prostration, with their protean mimicry of uterine symptoms,—unmarried often because they are not well enough to wed. If woman is to be thus stunted and deformed to meet the ambitious intellectual demands of the day, if her health must be sacrificed upon the altar of her education, the time may come when, to renew the worn-out stock of this Republic, it will be needful for our young men to make matrimonial incursions into lands where educational theories are unknown" (Goodell).

Unhygienic Conditions.—General and Local Cleanliness.—The general health is often impaired by neglecting personal cleanliness, which results in blocking up the pores of the skin and interfering with the function of one of the most important and necessary excretory organs of the body. While want of cleanliness is common among the lower classes, yet women of the higher grades of society are often careless or have improper ideas as to the care of the skin and the genital organs. The importance of the vaginal douche is frequently overlooked, and consequently many cases of pruritus vulvæ and other forms of vulvar irritation occur which are directly caused by irritating discharges from the vagina.

Care of the Bowels and the Bladder.—Constipation is an important factor in the causation of many diseases and symptoms peculiar to women. An overloaded bowel mechanically interferes with the pelvic circulation and tends to produce congestion of the uterus and its appendages. As a result misplacements of the uterus occur, followed by functional and organic disorders, which give rise to dysmenorrhea, menorrhagia, metrorrhagia, sterility, endometritis, etc. Slow toxemia frequently results from the absorption of the fecal matters by the blood in obstinate cases of constipation. The symptoms of this condition are characterized by headache, neuralgic pains, anemia, general indisposition and a slight basic heart murmur with deficient respirations and chest expansion. Irregularities in emptying the bladder, while not so injurious as constipation, have nevertheless a bad effect upon the pelvic organs. Habitual overdistention may be the primary cause of a retrodisplaced uterus or of vesical irritation, and neuralgic pains in different parts of the body not infrequently result.

Precautions During Menstruation.—The civilized woman, unlike her savage sister, does not recognize the importance of physical and mental rest at the time of the menstrual periods, and consequently many pelvic disorders are directly traceable to carelessness, neglect, and imprudence upon her part. She exposes herself to the inclemencies of the weather, often wearing thin shoes or insufficient clothing, and makes no changes whatever in her daily social and household duties. If the continuance of the flow interferes with her plans, she often checks it by using a cold vaginal douche or taking a cold bath. Young girls, especially those passing through the period of puberty, are not permitted to rest quietly at home during their periods, but are sent as usual to school, where they are kept hard at work, ignoring absolutely the demands of nature. The sudden checking of the menstrual flow either by design or accident may cause inflammatory changes in the uterus, the ovaries, and the Fallopian tubes, which frequently result in endometritis, salpingitis, peritonitis, functional disorders, and sterility. Many of these women become invalids and are condemned to constant suffering as the result of neglecting common-sense precautions at the time of their menstrual epochs.

Exercise.—Daily exercise in the open air is essential to health, but unfortunately many women neglect this important means of keeping the muscular system and the organs of the body in a normal condition. The game of golf and other forms of outdoor sports have developed the physique and strengthened the sexual organs of the younger women, but unfortunately many of the older women take but little or no exercise, and consequently suffer from obesity, impaired digestion, irregularities in the menstrual function, neuralgic pains, loss of appetite, and chronic constipation. While the importance of exercise cannot be overestimated, yet we must bear in mind that it should be regulated to meet the requirements of the individual, and that overexercise is also apt to be followed by evil results. Furthermore, exercise is contraindicated during menstruation, and young girls and women should not dance or engage in outdoor sports at a time when nature demands bodily and mental rest.

Food.—The health of the entire body depends upon the character of the food, and hence errors in diet are among the most frequent causes of disease. The normal condition of the generative organs cannot be maintained by poor blood or an exhausted nervous system, and consequently women often suffer from various symptoms or pelvic affections which are directly caused by the state of their general health. Thus, the uric acid diathesis often produces dysmenorrhea and local neuralgic pains; anemia is frequently responsible for amenorrhea, certain forms of endometritis, and various other conditions dependent upon impoverished blood; and chronic dyspepsia or constipation, too often the result of over-indulgence in eating and drinking, adds to the already long list of female complaints. The drinking and overfeeding of women in large cities, especially in fashionable society, have a marked causative influence upon diseases of the female pelvis. The formal dinners and late suppers where unhealthful and indigestible foods and drinks are taken are certainly not conducive to a strong body with normal functions, and consequently women who thus indulge their appetites eventually suffer from an undermined constitution and chronic pelvic disease.

Dress.—The chief faults in the methods of dressing are insufficient protection of the body from cold and dampness, constriction of the waist, and traction upon the abdominal muscles by the clothing.

If the entire body is not protected from cold, the blood is driven from the surface and the internal organs become congested. The pelvic viscera are very susceptible to these influences, especially during menstruation, when the parts are naturally engorged with blood. Serious injuries are therefore frequently caused by wearing thin shoes, or undergarments made of unsuitable materials, which leave the neck, the chest, the arms, the abdomen, and the lower extremities unprotected. Women who habitually wear *décolleté* or very light gowns often suffer from functional or organic disorders of the pelvis through exposing themselves to sudden changes of temperature, especially when, after becoming overheated by dancing, they leave the ball-room and become chilled by sitting in a draft.

The mechanic effects of abdominal constriction seriously interfere with the normal conditions and the functions of the thoracic, abdominal, and pelvic viscera. Thus, respiration is modified by restricting the play of the diaphragm, displacing the heart, and compressing the lungs and the abdominal muscles. The up-and-down motions of the abdominal and pelvic organs, which are dependent upon full inspiration and expiration, and which assist materially in favoring intestinal peristalsis and equalizing the circulation of the pelvis, are injuriously restricted by crowding the diaphragm and the lungs. Tight lacing also displaces the abdominal viscera downward upon the pelvic organs, weakens and atrophies the abdominal walls, and impairs the function of all the organs. The uterus is usually displaced backward and downward, obstructing the pelvic

circulation and causing chronic congestion, which results eventually in functional and organic disorders. The uterine appendages are likewise crowded out of their normal position; the Fallopian tubes are bent and the relation existing between their fimbriated extremities and the ovaries is destroyed. Constriction of the abdomen during pregnancy may produce abortion or premature labor, or it may change the normal presentation and position of the fetus. It also increases the natural congestion or hyperemia of pregnancy, and therefore predisposes to varicose conditions of the thighs and the vulva. These women usually have weak labor pains and convalescence is delayed by a slow involution of the pelvic organs. The organs of the abdominal cavity also suffer seriously from the pressure exerted upon them by tight corsets. The capacity of the stomach is lessened and the food passes into the duodenum before it is prepared for intestinal digestion. This results in gastric and intestinal dyspepsia, which is accompanied by distention of the bowels. The transverse colon and the kidneys are displaced downward, the liver is compressed, and its ducts may be obstructed. The constipation which usually results from tight lacing is caused by the gastric and intestinal indigestion, the loss of peristalsis, and the constant pressure of the displaced pelvic organs upon the rectum which in time lessens the rectal reflexes. Appendicitis has also been traced to the wearing of tight corsets. While the evil effects of tight lacing upon the health cannot be disputed, yet there is no valid reason against wearing corsets which are properly made and applied, except in the case of women whose occupation requires them to bend forward when in a sitting position. Under these circumstances corsets exert an injurious pressure upon the abdomen and crowd the viscera down upon the pelvic organs.

The habit of supporting heavy clothing from the waist has the effect, as in tight lacing, of also pressing the contents of the lower abdomen downward upon the pelvic organs.

High-heeled shoes are injurious because they cramp the feet and prevent active exercise. They are especially harmful when worn by young girls before the articulations of the body are fully developed, as they alter the normal spinal curvature and pelvic obliquity. Garters worn around the thighs predispose to varicose veins of the legs.

Rest.—Women often destroy their health and exhaust their nervous energy by keeping late hours and by not devoting sufficient time to sleep. This is especially true of young women in fashionable society, who night after night attend late social functions and consequently suffer in time from neurasthenia and menstrual irregularities.

Childbirth.—Injuries Resulting from Labor.—Injuries resulting from labor are a frequent cause of pelvic disease. The lower classes, owing to poor environment, and unskilful or careless attention upon the part of the physician, suffer more often from traumatisms and their results than women in the higher grades of society. The immediate and remote results of these injuries depend upon their situation and extent. Tears of the perineum destroy the integrity of the pelvic floor and result eventually in rectocele, cystocele, hemorrhoids, and displacements of the pelvic organs. If the tear involves the sphincter ani, incontinence also results. Lacerations of the cervix retard or check involution of the uterus and predispose to endometritis, menorrhagia, displacements, eversion of the cervical mucous membrane, cystic degeneration, and malignant disease. Deep lacerations of the vaginal vault may open into the base of the broad ligaments, and in the majority of instances genito-urinary fistulas are caused by traumatisms of labor. All lacerations are immediately dangerous on account of the increased liability to sepsis, while the remote results are generally due to interference with involution or the pelvic circulation and to the destruction of the normal supports of the pelvis.

Bad Management During Labor.—Women frequently lose their lives or are condemned to chronic invalidism from unskilful, careless, or neglectful attention during labor. The trained nurse and the practical teaching of obstetrics in our colleges have undoubtedly done much to lessen the dangers of labor, yet we cannot ignore the fact that many women are still uselessly sacrificed from these causes.

Bad Management After Labor.—Bad management after labor is unfortunately a very common cause of pelvic disease. The obstetrician must always bear in mind that normal convalescence depends upon a healthy involution of the organs and that any cause or condition which interferes with this process produces immediate or remote results which are more or less dangerous to life or to health. The most frequent and at the same time the most preventable errors in the management of puerperal patients are—the failure to recognize and repair lacerations; an imperfect antiseptic technic; the custom of keeping the patient upon her back for several days or longer after delivery; the use of a tight bandage; and getting up too early after confinement.

A careful examination should be made immediately after labor for the presence of lacerations involving the perineum and the vagina, and before the patient is finally discharged the entire genital tract should be thoroughly investigated in order to make sure that no traumatisms have been overlooked. This routine practice is essential to the future welfare of the patient, as neglected lacerations will eventually result in conditions which are exceedingly difficult to cure by late secondary operations.

An imperfect antiseptic technic upon the part of the obstetrician or nurse should be strictly guarded against, as infection is one of the most unfortunate and dangerous accidents that can happen to a lying-in woman.

The custom of keeping a puerperal patient upon her back for an indefinite time after labor is a pernicious and unreasonable practice. In the dorsal recumbent posture the heavy uterus must of necessity fall backward and downward, its ligaments being put upon the stretch and the pelvic circulation more or less obstructed. Furthermore the lochial discharge collects in the vaginal culdesac, forming a stagnant pool which interferes with free drainage and increases the dangers of sepsis. This practice, therefore, checks involution, predisposes to puerperal septicemia, and is a frequent cause of chronic retrodisplacements of the uterus. The use of a tight bandage after labor, especially when a compress made of several towels is placed directly over the uterus, cannot be too earnestly condemned. The practice is absolutely contrary to reason and is injurious to the patient. Tight compression of the abdomen forces the intestines down upon the pelvic organs and pushes the uterus and its appendages back against the sacrum. As a consequence the uterus may be bent upon itself, its circulation obstructed, and the lochial discharge kept up beyond its normal time. The position of the uterus also predisposes to a permanent retrodisplacement, and a laceration of the cervix, if it exists, is prevented from healing by crowding the neck of the uterus against the vagina and thus everting the torn surfaces. And, finally, the Fallopian tubes may be bent and their secretions escape into the peritoneal cavity, causing sufficient irritation to set up a slight exudative inflammation.

Allowing the patient to get up too soon after confinement or after an abortion will almost surely result in subinvolution and displacement of the uterus. Rest is essential after labor, in order that involution may go on normally and that the parts may be restored to their original condition. Assuming the erect position too early puts an abnormal strain upon the uterine ligaments, which, becoming stretched, allow the uterus to descend and the circulation of the pelvis to become obstructed.

Sepsis.—In the vast majority of instances, for the reasons previously discussed, septic infection is due to bad management on the part of the physician or the nurse, during or after confinement. In some cases, however, puerperal septicemia may result from a previously existing pelvic disease becoming suddenly active after labor, and thus, as the result of either an extension of specific inflammation or the rupture of an old pus tube, septic infection of the peritoneum may occur.

Sexual Relations.—Marriage.—The primary object of nature in the creation of the sexes is the continuance of the race, and the fulfilment, therefore, of a woman's destiny is completed by marriage. Nature is an exacting mistress and resents any interference with her laws by causing atrophy in organs which are neglectful of their functions. This rule not only applies to the organs of generation, but to all parts of the body, and perfect health and symmetry of action can only be obtained by all the bodily functions fulfilling their purpose. Thus, if the muscular system is weakened and atrophied from want of exercise, the general health of the individual suffers, and in like manner the condition of the entire system depends upon the vigor of the genital organs. While single women naturally escape the accidents dependent upon marriage, pregnancy, and labor, yet they suffer, in many instances, from certain conditions resulting from celibacy. They are, for example, more liable to develop uterine fibroids; the ovaries often become painful and cirrhotic; the superficial fat disappears from the body and they become thin; they are apt to be anemic and suffer from neurasthenia; and the menstrual flow may become irregular as to its periodicity, quantity, and duration.

Long engagements are a common cause of the break-down which happens to so many young women when, for financial or other reasons, their marriages are indefinitely postponed. What Playfair describes as the "sexual engorgement in love-making" is responsible for the backache, the fatigue, the hysteria, the nervous exhaustion, the anemia, the leukorrhea, the menstrual irregularities, and the general debility which so often result in these cases.

The marriage of women suffering from pelvic disease is often followed by acute exacerbations due to the congestion and traumatism of sexual intercourse upon an otherwise quiescent lesion, and not infrequently serious domestic unhappiness results when pain or a mechanic obstruction prevents coitus. It is for this reason that complete hysterectomy is contraindicated as a routine operation because of the shortening of the vagina, which seriously interferes with the sexual act. Furthermore, the question of sterility often arises when marriage is contemplated, as an unfruitful union may be a source of great disappointment and consequently the cause of a slowly developing neurasthenia. And, finally, it must always be borne in mind that certain conditions, such as menstrual irregularities and functional disorders of the nervous system, are frequently benefited by marriage.

Sexual Intercourse.—Women often suffer both locally and in general health from unnatural interference with sexual intercourse. The most frequent excuse for disturbing the normal relations is the prevention of pregnancy, a practice which is unfortunately but too common at the present day. The sexual act must be complete, and any interference with the normal function of coitus by "withdrawal," the use of condoms or injections, or other means to prevent conception causes congestion of the pelvic organs which eventually leads to functional and organic disease. Sexual excess exhausts the nervous system and in time produces chronic congestion of the uterus and its appendages and results in endometritis, menorrhagia, and other forms of pelvic disease. Violent intercourse during pregnancy may cause abortion or premature labor. Vaginismus

is often the result of brutal or ineffectual attempts at intercourse, while impotency upon the part of the male produces congestion of the female organs and neurasthenia. Coitus during menstruation has been known to cause pelvic hematocele. Masturbation and all forms of sexual perversion result in local congestion and impairment of the health. A disproportion between the male and female organs may cause various degrees of traumatism. This is frequently observed in cases of rape when the victim has not yet reached the period of puberty. A penis of excessive length may injure the pelvic organs by direct contact during coitus.

Criminal Abortions.—The chief danger of criminal abortions is sepsis, which may cause immediate death or result in sterility and chronic invalidism from permanent damage to the Fallopian tubes. Again, subinvolution or displacements of the uterus are very apt to follow, as patients do not remain long enough in bed for the organs to return to their original state. In cases of incomplete abortion the ovum or the membranes may remain in the uterus for a considerable length of time and cause a continuous hemorrhage, which often produces a profound anemia. The ignorance, as a rule, of the professional abortionist on all matters pertaining to antisepsis and the subsequent management of the case; the secrecy demanded, which does not allow the patient to receive the proper care and attention; and the utter disregard of the serious nature and dangers of the operation, contribute to make criminal abortions especially fatal or liable to be followed by chronic tubo-uterine disease. On the other hand, what a different picture is presented when the gravid uterus is emptied of its contents for therapeutic reasons! There is no secrecy because there is no criminality, and the operation is performed practically without danger to life because sepsis is prevented by a proper operative technic and the environment of the operating room, while the remote consequences are guarded against by the subsequent care and attention.

Venereal Diseases.—Gonorrhea and syphilis produce pathologic conditions which are peculiar to women.

Gonorrhea is the most frequent cause of those grave pelvic lesions which result in loss of life, sterility, or chronic invalidism. When the infection attacks the urethra, the effects are the same as in the male; but when the vulva is the seat of disease, the specific inflammation is liable to enter the ducts of the vulvovaginal glands and cause an abscess or a chronic form of gonorrhea, or, again, the specific virus may extend to the uterus and its appendages and the peritoneal cavity. The absence of glands in the vaginal mucous membrane is the probable reason why that organ is so seldom primarily infected. Latent gonorrhea is very frequent in both sexes, and the disease may remain in a dormant state for years, but still retain its power to infect another person. This is the explanation of the fact that so many young wives are infected by husbands who have not had gonorrhea for months or years before marriage and who are unconscious of any local trouble. The importance, therefore, of the absolute cure of all gleety discharges before marriage cannot be overestimated. Latent gonorrhea is the cause at times of puerperal sepsis and of recurrent attacks of peritonitis. The infection of a woman with gonorrhea does not, as a rule, produce acute symptoms, but gradually causes subacute pelvic manifestations accompanied with impaired health and sterility. Gonorrhea occurring in childhood as the result of rape or accidental infection may cause an arrest in the development of the genital organs.

The primary and secondary manifestations of syphilis when they attack the vulva are more or less modified by the character of the external organs. Thus, the heat and moisture of the parts as well as the effect produced by apposing surfaces are apt to alter the usual characteristics of chancres, condylomata, and other lesions. Chancroids for the same reasons are often atypical in their course.

Accidental Infections and Traumatisms.—Formerly septic infection following intrauterine medication and treatment was a most common cause of disease. Fortunately, however, modern views have in a large measure done away with this source of danger by relegating to the past the routine office use of the uterine sound, the employment of tents or stem pessaries, the direct medication of the endometrium by injections or by cotton-tipped probes saturated with an astringent or alterative remedy, and dilatation of the uterus without an anesthetic. Bad results are likely to follow an imperfect antiseptic technic in minor operations upon the uterus, urethra, or bladder. Atresia of the cervical canal may result from an amputation of the cervix or a trachelorrhaphy, or from the application of strong acids to the uterine cavity. Rough manipulations during a pelvic examination of an adherent uterus or of diseased appendages may produce acute pelvic inflammation and even death. A badly adjusted or cared for pessary may cause serious injury from pressure or septic inflammation. Vaginal injections containing bichlorid of mercury or carbolic acid may cause poisoning from absorption unless the vagina is subsequently irrigated with plain sterile water or normal salt solution.

The Different Periods of Life.—Women are susceptible or exposed to certain diseases or accidents during the different periods of life, beginning at infancy and ending with senility.

CHAPTER XIII.

HISTORY TAKING.

A clear and concise history of the subjective symptoms of every patient is important. It not only serves as a guide in making the physical examination, but also brings out symptoms which may be overlooked.

In taking the history a regular order in asking questions must be observed, otherwise important points in the case are sure to be neglected. It is unnecessary to have a printed book for recording histories. They may be kept in a large blank-book or on cards which are filed away alphabetically. It is much more satisfactory to record a history in this manner than to write down the symptoms under printed headings and subdivisions; the latter method lacks continuity and does not make a connected statement.

The following order must be observed in taking the history:

1. The patient's statement.
2. Name and address.
3. Age.
4. Single; Married; Widow.
5. Occupation; Habits.
6. Menstruation.
7. Child-bearing record.
8. Discharges.
9. Pain.
10. The bowels and bladder.
11. General health.
12. Family record.
13. Particular symptoms.
14. Summary of symptoms.

The Patient's Statement.—It is not good practice to begin at once asking questions; rather let the patient explain her condition in her own words, as it enables the examiner to become better acquainted with her and gives him a clearer idea of the chief symptoms.

Name and Address.—Always keep a record of the name and address; the reasons are obvious.

Age.—The age of a patient is important because she is liable to certain diseases at particular periods in her life.

During *injancy* the organs of generation are without function, and consequently the child does not suffer from diseases peculiar to her sex.

At *puberty* the girl is in a transition state. She is neither a child nor yet a woman. Her reproductive organs are undergoing rapid development and the appearance of the menstrual flow indicates that ovulation is being established and that she is passing into the child-bearing period of her life. Irregularities in the functions of the organs of generation at this period have a far different significance than disturbances later on when a woman has reached full maturity. For example: as a rule, menstruation does not occur at regular periods during puberty. The first menstruation may be followed by a period of rest lasting from two to three months, and frequently the flow does not become regular for a year or more. Again, the flow itself may be irregular while the subjective disturbances of menstruation may occur every twenty eight days. Furthermore, there is more distress and pain at the time of menstruation during the period of puberty than later on, when all the functions have been fully established. The mind and character of a young girl during puberty are undergoing those changes which are eventually to produce in her the typical characteristics of her sex. This fact, therefore, must be considered in weighing the evidence between diseased conditions and symptoms which may be dependent upon development. We must not, however, attribute every symptom to physiologic phenomena. This would be a mistake, because pathologic conditions are frequently met during puberty. For instance, in cases of imperforate hymen the subjective symptoms of menstruation occur regularly, but there is no appearance of the flow. While it may be perfectly normal during puberty to have the subjective symptoms occur regularly without the same regularity in the appearance of the flow, yet the fact that menstruation has never been established would indicate at once some abnormal condition.

The *child-bearing period* is the most important time of a woman's life. She has reached full maturity, and it is during this epoch that the vast majority of the pathologic conditions peculiar to her sex occur. Irregularities at this time in the functions of the reproductive organs, as well as many other symptoms, are pathologic, and the cause or causes for them must be found; and while we may often assure a young girl who is passing through puberty that nature will effect a cure, the same does not hold good in a woman during the child-bearing period.

The *menopause* is a period in the life of a woman during which atrophic changes are taking place in the organs of generation. These changes occur slowly, covering a period of two or three years, and while this is a critical time in a woman's life, she should pass through it, as a rule, without any special symptoms. It is a grave mistake to tell a patient who is suffering from symptoms at this time that nature will effect a cure, and dismiss her without a physical examination. Many lives are thus lost because the attending physician fails to realize that menorrhagia and metrorrhagia occurring at the time of the menopause are always pathologic, being caused in the majority of cases by malignant disease of the uterus. He neglects in the beginning to make an examination, believing that the "change of life" is the cause of the symptoms, and it is too late to perform a radical operation when the mistake is discovered. The physician must have a thorough knowledge of the subjective and objective symptoms which are natural to the menopause, so that he may be able to recognize those manifestations which are dependent upon disease. It is safer to make an apparently unnecessary examination during this period than to remain in doubt as to the meaning of a symptom.

Senility is the last stage in the life of a woman. It is the period of sexual rest

and functional inactivity. The atrophic changes of the menopause are now completed, the external organs of generation and the breasts are shrunken and flabby, the vagina is shorter and more contracted, the vaginal portion of the cervix has disappeared, the cervical canal closed, and the uterus and its appendages atrophied.

Single; Married; Widow.—The social state of a woman has an important bearing on the diagnosis.

An *unmarried* woman has not passed through pregnancy and labor, which are often directly the causes of many of the diseases complained of by women. She has not run the risk of infection from a husband suffering with latent or acute gonorrhea. On the other hand, she is more liable to painful menstruation, to fibroid tumors of the uterus, and later on in life to cirrhotic changes in the ovaries. We must always bear in mind the possibility of sexual intercourse occurring in unmarried women.

In *married women* and *widows* who have borne children we must remember the possible existence of lesions due to gonorrhea, sepsis, or traumatism following labor, and pathologic conditions the result of interfering with conception.

Occupation; Habits.—Many diseases peculiar to women are due either directly or indirectly to their occupation and habits, and it is most important, therefore, in every instance to obtain a thorough knowledge of these conditions. By intelligently considering the occupation and habits of a patient and correcting various irregularities and abuses we may frequently relieve existing symptoms and bring back a condition of health.

A knowledge of the predisposing causes of gynecologic diseases is essential in making a correct diagnosis and instituting a successful line of treatment. For example, take a case of amenorrhea occurring in a hard-working woman, who is underfed, has poor hygienic surroundings, and who possibly is anemic and exhausted. What good, under these circumstances, would follow the use of drugs to determine the flow of blood to the pelvic organs, of medication to the vault of the vagina, or of any form of treatment directed to the pelvis? The cause of the amenorrhea is not pelvic in origin, but is directly the result of the woman's mode of life and surroundings. She does not menstruate because there is not the blood and the necessary nerve force to keep up the function, consequently the only successful plan of treatment is to remove the causes and improve her health, letting the pelvic organs severely alone.

There is nothing relative to the habits and occupation of a patient but what is of importance from a diagnostic and therapeutic point of view, and we cannot therefore be too thorough in our investigations. The arrangement and character of the clothing worn by the patient; the care of the skin, the bladder, and the bowels; the diet and the regularity of taking food; the amount of exercise in the open air, as well as the time devoted to rest and sleep, should be carefully considered. It is important also to inquire into the precautions taken during the menstrual periods. This is especially true in young girls, as their health frequently suffers from too close attention to study and confinement in the classroom during menstruation. Careless and injurious habits during the menstrual periods are often the cause of uterine and pelvic disease. Women frequently expose themselves to the inclemencies of the weather, to overexercise, and, in some instances, they make use of cold water vaginal douches to cut short the menstrual flow so that social engagements may not be interfered with. The importance, therefore, of a woman's habits cannot be overestimated, as the diagnosis, in many instances, is of no value unless the causes are recognized and removed.

It must be remembered that active and passive congestion of the pelvic organs may be caused by sexual intercourse occurring during the menstrual period, or to the methods which are employed to prevent conception, such as the use of vaginal injections, condoms, etc. These conditions disturb the normal relations of the sexual act and are often followed by inflammatory and organic lesions of the pelvic organs. Tact must always be exercised in questioning a patient on matters pertaining to the sexual relations, as the subject is a delicate one and the natural modesty of women should be respected. It is good practice to wait until the physical examination has been made before referring to the subject, and even then it is still better to talk with the husband unless the patient voluntarily mentions it.

Menstruation.—A careful investigation must be made of the menstrual history of every patient. A knowledge of the normal conditions is essential, if the value of abnormal symptoms is to be correctly estimated. It is also necessary to remember that every woman is a law unto herself, and that the *period*, the *duration*, and the *quantity of the flow* are controlled more by the personal equation than by hard and fixed rules. There is, of course, a general average governing the various phenomena of menstruation and ovulation, but the line of perfect health may be far removed in some instances while in a number of other cases it may be only approximate. To judge correctly of the value of the phenomena of menstruation in a given case, the *type* must first be ascertained. This can only be done by investigating the characteristics of the flow soon after it has been fully established at puberty. During this period a woman develops *her type*—by type we mean the periodicity, the quantity, and the duration of the flow; and if later on in life she continues to conform with it, her condition is a normal one, no matter how far it may be removed from the general average.

The chief subjects to consider in the investigation of the menstrual history are, the date and record of puberty, and the periodicity, the quantity, and the duration of the flow, as well as any abnormal symptoms which may be present.

The age at which menstruation first appeared must be ascertained. This fact will give us some idea as to when the menopause may be expected. An early puberty means a late menopause; on the other hand, if a girl reaches maturity late in life, it indicates a lack of sexual vigor, and the climacteric is likely to occur before the usual time. The history of puberty reveals the *type*, which is necessary to know in order to estimate pathologic variations correctly.

We ask the patient the length of time between the menstrual periods and compare her statement with the type already ascertained. Perfect health is consistent with occasional deviations from the original periodicity of the flow. There are so many factors, both mental and physical, which affect the regularity of menstruation without any apparent injury to the health that we must be very careful not to lay too much stress upon occasional deviation. Again, we must bear in mind that permanent deviations from the original type are not inconsistent with health. We frequently meet women, especially those who have borne children, who menstruate a day or two ahead of time without any apparent effect upon their health or the pelvic organs.

The next question to consider is the quantity of the flow. The amount of the flow is of more importance than its duration. There is always a cause for excessive bleeding at the time of menstruation—it is a symptom of a pathologic condition—and its origin must be determined before considering the question of treatment. A full history is important, therefore, in all cases of menorrhagia, as the life of a patient may depend upon a correct diagnosis.

The average duration of the flow is less constant than other characteristics

of menstruation. The duration in a given case must always be compared with the type. Health is not inconsistent with irregularities in the length of the menstrual periods provided the quantity of the flow is not increased.

The subjective symptoms of menstruation are not marked, and women who are normal only experience a sensation of weight and bearing-down in the pelvis and in the lumbosacral region. Pain indicates a pathologic condition. There are so many causes, both local and general, producing irregularities in the menstrual function that an intimate knowledge of the subject is necessary to diagnose and treat this class of cases successfully. The causes of the abnormalities of menstruation are fully considered elsewhere and need not, therefore, be enlarged upon here. We must, however, always bear in mind the ever-present possibility of pregnancy and the necessity for a thorough investigation of the effect of habits, social conditions, etc., upon the function of menstruation.

Child-bearing Record.—We ascertain the number, dates, and histories of the labors at term, and also the cause of any miscarriages that may have occurred. Rapidly succeeding pregnancies often lie at the root of certain pathologic conditions. For example, the hypertrophy of the left ventricle which normally takes place during pregnancy may become permanent, if the recurrence is rapid, and result in an organic lesion of the heart. The character of the labors often indicates what we may expect to find upon physical examination. Thus, a rapid labor may cause injury to the soft parts or an instrumental delivery may result in extensive tears of the cervix, the vagina, and the perineum.

The history of a patient during convalescence after confinement gives us a practical knowledge, in many instances, of the state of the pelvic organs, so far as conditions dependent upon sepsis are concerned. If there is a history of puerperal septicemia, we may expect to find a pelvic lesion unless the patient has subsequently borne a child, which fact would prove that the oviducts had not been permanently damaged. Premature deliveries and miscarriages are a constant source of septic infection, and a pelvic examination must always be insisted upon in these cases. If a patient gives a history of having had an abortion, we must ascertain at what period of gestation it occurred, and if possible the cause. The general causes of abortion must be borne in mind, otherwise many points in the diagnosis and treatment will be overlooked. The paternal as well as the maternal causes must be considered in cases of spontaneous abortion, as such diseases as phthisis, syphilis, and alcoholism in the father may affect the fetus and render a miscarriage inevitable. The maternal causes are of more importance, and too much care cannot be taken in their investigation. Criminal abortions are especially liable to be followed by septic infection. This is due to the want of technic knowledge and a lack of antiseptic precautions upon the part of the professional abortionist.

If a woman is sterile, inquire if she employs any method to prevent conception. If she does, it is unnecessary to look further for an explanation of her condition. On the other hand, if she is naturally sterile we must endeavor to find the cause, and not lose sight of the fact that the husband may be at fault.

Discharges.—We ask the patient if she has a discharge between the menstrual periods. If she answers in the affirmative, we must inquire as to its history and character.

The history and character of a discharge frequently explain the existence of lesions found upon physical examinations. Thus, a discharge following puerperal septicemia or gonorrheal infection would explain the presence of a chronic endometritis or pus tubes. Discharges which are associated with grave pelvic lesions generally present a definite cause and are the result either of septic infection or gonorrhea. The discharge which comes on so gradually that the patient

is unable to fix the date of its appearance is, as a rule, due to passive congestion and does not result in serious pelvic disease.

A discharge from the genital canal other than the menstrual flow is spoken of as a *leukorrhea*, or "*the whites*." It may come from the vulva, the urethra, the vagina, the cervix, the cavity of the uterus, or the oviducts. The normal secretions from the different portions of the genital tract have their peculiar characteristics; thus, from the vulva and vagina they are whitish in color and of a creamy consistency, from the cervix they are tenacious and clear, like the white of an egg, and from the uterine cavity and oviducts they are thin and white.

The normal secretions are altered by disease, and at times it is impossible to determine their source without the aid of the microscope. Severe inflammations and infections due to gonorrhea or sepsis produce pus cells, and the discharge becomes purulent. The presence of blood also changes its distinguishing properties, and it becomes sanguineous in character. An offensive odor indicates putrefaction, and is frequently caused by cancer or a sloughing polyp.

Hypersecretion is not necessarily a sign of disease, as it may be due to a slight congestion from a temporary cause and requires no special attention. Many women also have a leukorrheal discharge just before and after each menstrual period, which is caused by the monthly congestion of the pelvic organs.

As a general statement we may say that a discharge which occurs before puberty has its origin from the vulva, and after that period its source is, as a rule, uterine.

Pain.—Pain is the most constant gynecologic symptom, and it is situated, as a rule, in the *lumbosacral* and *inguinal regions*.

Lumbosacral pain or backache is not characteristic of any special form of pelvic lesion, and it may be due to a variety of causes, as, for example, the pressure of a uterine or pelvic tumor, dragging upon the uterine ligaments, especially the uterosacral, chronic constipation, etc. Retrodisplacements of the uterus are a common cause of backache, and the symptom is most marked when the womb is bound down by adhesions.

Pain in the inguinal regions usually indicates disease of the uterine appendages or ligaments, but its true cause can only be determined by a physical examination.

Pain may also be situated within the pelvis, above the symphysis pubis, at or near the coccyx, in the anus, the rectum, the vulva, the vagina, or along the course of the urethra, or it may be associated with a function of one of the pelvic organs. Pain due to a pelvic lesion may be referred to a distant part of the body; thus, there may be neuralgia of the anterior crural and external cutaneous nerves of the thigh, or it may be felt in the region of the heart, the abdominal viscera, the head, the face, or the mammary glands.

Ask the patient if she has pain, and if she answers in the affirmative ascertain the following details: Where it is situated; the point of greatest intensity; whether it is spontaneous or evoked; its characteristics; the effect of exercise upon it and its possible connection with a function of one of the pelvic organs.

The situation of pain at once directs our attention to the probable seat of trouble. Thus, in a lesion of the coccyx the pain will be felt in the coccygeal region; the same is true of the anus, the rectum, the bladder, the vagina, and of all the pelvic organs. If the pain is felt within the pelvic cavity, its point of greatest intensity will indicate in a general way the organ involved. Spontaneous pain is, as a rule, caused by an acute condition, while evoked pain indicates a more or less chronic disease. The characteristics of a pain often show the nature of the lesion. In retrodisplacements of the uterus the pain is felt as a dull ache, in acute inflammations of the uterine appendages it is sharp and lancinating, in the

obstructive forms of dysmenorrhea it is paroxysmal, while in inflammatory diseases of the external organs of generation it is burning or itching in character. Exercise or exertion of any kind increases pain.

Pain may be associated with a function of one of the pelvic organs; thus, painful menstruation (*dysmenorrhea*) or pain during coitus (*dyspareunia*), urination, or defecation may be mentioned as examples.

Pain in distant parts of the body should be carefully investigated and its possible connection with a pelvic lesion borne in mind. It must also be remembered that pain may be referred to the opposite side to that in which the disease is situated. This is not common, but we find it to be the case, for example, in lateral displacements of the uterus which put the ligaments of the opposite side upon the stretch.

The Bowels and Bladder.—We must question the patient as to the condition of the bowels and bladder.

Constipation is the rule in a large proportion of women, and it is all-important to determine its causes and results upon the pelvic organs. The causes of constipation are due, *first*, to those conditions which are common to both sexes; and, *second*, to those which are peculiar to women. One of the most frequent causes from a gynecologic standpoint is a retrodisplaced uterus. The constant pressure of the fundus upon the upper part of the rectum dulls the rectal reflexes and consequently the presence of feces ceases to excite defecation. The same condition results from the pressure of adhesions and pelvic tumors. Lacerations of the pelvic floor interfere with the mechanism of defecation and render it difficult for the patient to completely empty the bowel.

Constipation is not only responsible for a number of so-called gynecologic symptoms, but is also the cause of many local and general diseases. A chronically overdistended rectum, for example, pushes the uterus forward in the pelvis and stretches the uterosacral ligaments and eventually results in a permanent backward displacement. Congestion of the pelvic organs and hemorrhoids are also due to constipation. In obstinate cases the patient's general health suffers from the absorption of fecal matters by the blood, which gives rise to a well-known train of symptoms. Prolapse of the rectum and fissures of the anus result from straining at stool.

We must always remember the necessity for a full investigation of the rectal symptoms, and the importance of the gynecologic causes of constipation and its effect upon the local organs and the general health. The relief of constipation alone is often followed by the disappearance of many of the so-called gynecologic symptoms.

Some women suffer from diarrhea at the time of menstruation.

Bladder symptoms are very frequent in woman. The most common are, pain, frequent urination, and retention or incontinence of urine. Some women have more or less vesical irritability at the time of the menstrual periods; this is not pathologic.

In investigating urinary symptoms we must *first* consider those causes which are common to both sexes, and *second* those which are peculiar to women. The gynecologic causes are due to the anatomic arrangement of the pelvic organs, their functions and diseases. These facts must be borne in mind when taking the history of a patient. Owing to the anatomy of the female pelvis the support of the bladder and the urethra is often destroyed by traumatisms occurring during labor which produce various degrees of prolapse. The intimate relation existing between the bladder and other pelvic organs frequently causes functional urinary disturbances as well as organic diseases which are due to the extension of inflammation. The various functions of the organs of generation,

such as menstruation, sexual intercourse, child-bearing, and labor, expose women to many diseases and injuries which are often directly or indirectly the cause of functional or organic urinary disorders. Pressure upon the bladder by a pelvic tumor or an enlarged or displaced uterus may cause frequent urination as the result of irritation or lessened capacity. If the pressure is firm and directed against the base of the bladder so as to shut off the urethra, retention of urine results. This condition is met in impacted pelvic tumors and incarcerations of the pregnant uterus.

The female bladder is less liable than the male organ to inflammatory attacks, and consequently severe forms of cystitis are comparatively rare. In many instances the urinary symptoms are purely reflex and are due to diseases in other organs.

General Health.—A careful history of the general state of the patient's health is important, as functional disorders of the alimentary canal and the circulatory and nervous symptoms are often dependent upon reflex irritations from pelvic diseases. Again, we may meet with patients who are suffering with pelvic symptoms which are dependent entirely upon organic diseases in other organs, and in whom no local pathologic condition is found. The importance, therefore, of a careful, general history must not be overlooked, as it is a valuable guide in making the physical examination and a great help in correctly judging between cause and effect. It enables us to locate the seat of disease and to place the proper value upon reflex symptoms in other organs or in other parts of the body. Amenorrhea may depend upon pulmonary phthisis; menorrhagia, upon a heart lesion; or various pelvic aches and pains upon nervous prostration and other general causes. On the other hand, we must remember that a pelvic lesion may be the primary cause of a nervous break-down, and that no improvement may be expected until the local disease is relieved.

Reflex symptoms in other parts of the body due to pelvic disease are very frequently met. Gastro-intestinal disturbances are the most common phenomena. Dyspepsia is frequent and is often associated with nausea and vomiting. Constipation with flatulence may be a distressing symptom, and in rare instances patients suffer from intestinal catarrh. Neurasthenia, next to gastro-intestinal disturbances, is a most important manifestation. The symptoms are naturally varied and there is nothing characteristic in their grouping to indicate the cause. The motor symptoms, as a rule, are not marked, although patients may be unable to take active exercise on account of the loss of muscular strength. The sensory phenomena are more or less constant, but they vary both as to the character and severity of the symptoms. Most patients complain of a tired feeling and an utter lack of desire to exert themselves. They may also suffer from headache, vertigo, cold hands and feet, or from cardiac palpitation.

Family Record.—In the study of disease, whether it is local or general, the family history is important. The mother's age at puberty may at times account for the late appearance of menstruation in the daughter; the same is true of the menopause. Menstrual peculiarities may be a family trait and certain families have a susceptibility to such hereditary diseases as cancer, neurosis, and tuberculosis.

Particular Symptoms.—Under this heading are included symptoms and pathologic conditions not previously considered. Thus, a patient may complain of a tumor or an enlargement in the abdomen or in some part of the genital tract; or, again, there may be some special symptom connected with a function of one of the organs of generation. A thorough history must therefore be taken of all particular symptoms, as they have an important bearing upon the diagnosis.

Summary of Symptoms.—The chief subjective symptoms must be written down under this heading, so that the examiner may have them clearly arranged before making the physical examination. Unless this is done, mistakes in the diagnosis are liable to be made.

CHAPTER XIV.

THE VULVA.

METHODS OF EXAMINATION.

The external organs of generation can be examined by the following methods:

Inspection.
Palpation.
Microscopic and bacteriologic examinations.

INSPECTION.

Limitations.—The vulva, the perineum, the anus, the vulvovaginal orifice, the inner surfaces of the thighs, and the external urinary meatus can be examined by inspection.

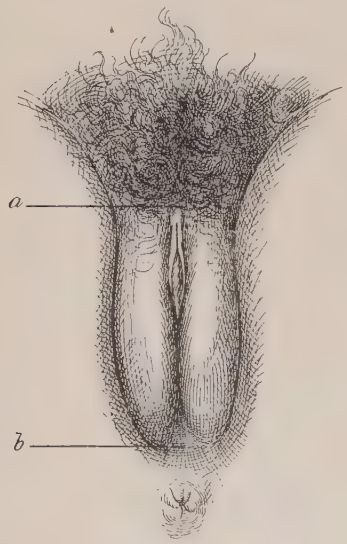


Fig. 161.

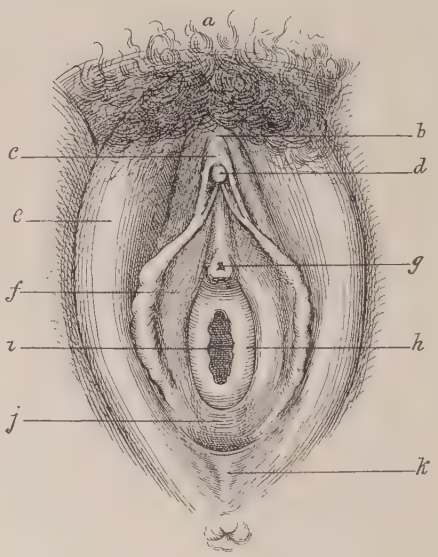


Fig. 162.

External Genitalia.

Fig. 161. **Genitalia closed:** *a*, Anterior commissure; *b*, posterior commissure. Fig. 162, **Genitalia separated:** *a*, Mons veneris; *b*, anterior commissure; *c*, prepuce; *d*, glans clitoridis; *e*, labium majus; *f*, labium minus; *g*, meatus; *h*, hymen; *i*, vaginal orifice; *j*, fossa navicularis; *k*, posterior commissure.

Information.—Inspection is one of the most valuable methods we possess for recognizing the various affections of the vulva and adjacent parts, as nearly all the lesions in these situations can be diagnosed by their appearance alone.

Preparation of the Patient.—No preparation whatever is required. If the parts are douched prior to the examination, the abnormal discharges are washed away and hence an incorrect diagnosis is likely to be made.

Position of the Patient.—The examination is made in the dorsal position.

Technic.—After placing the patient in the proper position the examiner sits or stands in front of the vulva and inspects the parts without disturbing their natural relations with each other. We note whether the two sides of the vulva are in apposition or whether the vulvar canal is gaping. In the latter case the woman has probably borne several children, and a more extended examination will reveal the presence of a laceration accompanied by prolapse of the anterior and posterior walls of the vagina (*cystocele* and *rectocele*). If the vulvar canal is closed, the labia should be separated and the vaginal orifice exposed. The examiner then notes the absence or presence of the hymen or its remains and any pathologic conditions that may be present.

The separate organs composing the vulva as well as the external urinary meatus are now examined, and finally the perineum and the inner surfaces of the thighs are inspected for the presence of eruptions or the extension of an inflammation such as a vulvitis. If there is any evidence of disease found at the urinary meatus, the urethra should be examined in the manner described elsewhere.

Any abnormal secretions which are observed on the vulva or adjacent parts during the examination should be carefully studied and their source, if possible, traced. Usually these discharges come from the vagina, but they may also be caused by a vulvitis, or, again, they may arise in the urethra or in the ducts of the vulvovaginal glands.

PALPATION.

The Limitations, Information, and the Preparation and Position of the Patient are the same as in Inspection.

Technic.—The examiner sits or stands in front of the vulva. The integrity of the perineum is first determined by introducing the index-finger into the vagina for a distance of one inch and placing the thumb externally so that its tip is at the edge of the anterior margin of the anus. By now estimating the amount of resistance and the thickness of the structures between these two opposing points the examiner can determine whether or not a *median tear* is present. The so-called skin perineums often appear normal on inspection, but when the parts are palpated the small amount of tissue found between the finger in the vagina and the thumb externally will at once demonstrate conclusively the presence of a laceration.

After completing the examination of the vulvovaginal orifice, the examiner then carefully palpates the pathologic lesions of the vulva which were seen upon inspection, in order to confirm or disprove the diagnosis.

MICROSCOPIC AND BACTERIOLOGIC EXAMINATIONS.

Limitations.—These methods of investigation are limited to the examination of the discharges which are found on the vulva or of those coming from the ducts of the vulvovaginal glands or the urethra.

Information.—We can determine the character of the infection in cases of vulvitis or in inflammation of the vulvovaginal glands or the urethral canal.

Technic.—The methods of collecting and preserving the discharges for a subsequent microscopic or bacteriologic examination are fully discussed in Chapter II.

MALFORMATIONS OF THE VULVA.

In considering malformations of the vulva it is important to recall to mind that the clitoris is derived from the *genital eminence*, which in the male becomes the penis; that the *genital folds*, which bound laterally the *genital furrow* on the under surface of the eminence, become in the female the permanently separate labia minora, while in the male their edges unite to enclose a canal, the penile urethra; that the penile urethra thus becomes continuous with the now enclosed urogenital sinus; which latter, in the female, remains open and constitutes the vestibule of the vagina; and that the *genital ridge*, which encircles the genital eminence as well as the site of the future anus, undergoes local thickening and

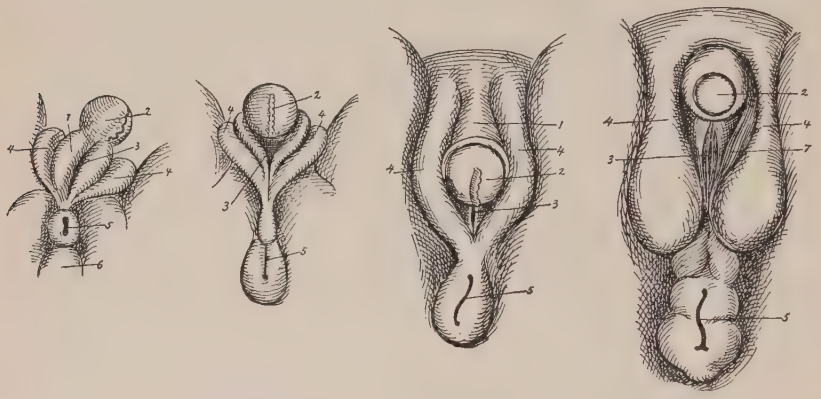


Fig. 163. Fig. 164. Fig. 165. Fig. 166.

Development of the External Genitalia.

1, Clitoris; 2, glans clitoridis; 3, urinogenital fissure; 4, labia majora; 5, anus; 6, coccygeal eminence; 7, labia minora (modified from Tourneux).

becomes in the female the labia majora, while in the male the laterally thickened portions unite with each other to form the scrotum.

As the male type of external genitalia represents a more marked deviation from the indifferent fetal condition than does the female type, over-development of one or more of the fetal structures in a female may easily produce a striking resemblance to male organs, thus giving rise to some form of false hermaphroditism. Less pronounced variations produce the minor or more familiar malformations of the external genitalia, such as enlarged labia majora, united labia minora, abnormally large clitoris, etc., the explanation of which is sufficiently indicated by what has been said above.

THE VULVA AS A WHOLE.

The following congenital anomalies have been observed:

Absence of the vulva.
Double vulva.
Infantile vulva.
Precocious development of the vulva.

Absence of the Vulva.—This condition is occasionally observed in non-viable fetuses and is nearly always associated with other anomalies in development. The anus, as a rule, is also absent, and the parts are covered with an unbroken skin surface extending from the symphysis pubis to the coccygeal

region. In cases in which the anus is present the child may live and void the urine through the umbilicus.

Double Vulva.—This is a very rare condition It is usually associated with an imperforate anus and a partial absence of the rectovaginal septum.

Infantile Vulva.—This anomaly is usually associated with an imperfect formation of the uterus and its appendages and a poorly developed general physique. The individual is apt to be chlorotic and sickly. The vulva resembles that of a child prior to puberty and the breasts are undeveloped.

Precocious Development of the Vulva.—This condition is occasionally seen in very young children several years before the normal period of puberty, and is marked by the usual physical and mental changes of adolescence.

THE CLITORIS.

The following congenital anomalies have been observed:

Absence of the clitoris.	Cleavage of the clitoris.
Atrophy of the clitoris.	Adherent prepuce.
Hypertrophy of the clitoris.	Redundant prepuce.

Absence of the Clitoris; Atrophy of the Clitoris.—In rare instances the clitoris has been found to be absent, and in exceptional cases it may be atrophied or smaller than normal.

Hypertrophy of the Clitoris.—A slight hypertrophy of the clitoris is by no means an uncommon condition, and in exceptional instances the organ may be as large as a moderate-size penis.

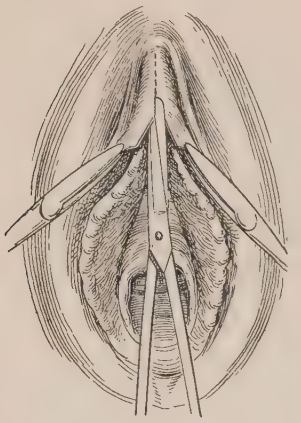


FIG. 167.—First Step.

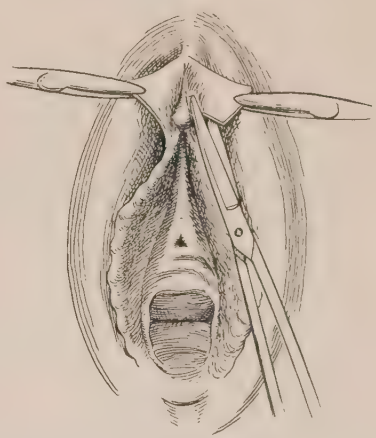


FIG. 168.—Second Step.

OPERATION FOR REDUNDANT PREPUCE.

Fig. 167, Division of the prepuce; Fig. 168, removal of the redundant portions (page 156)

Cleavage of the Clitoris.—Cases have been observed in which the clitoris was split in two lateral portions. As a rule, this malformation is associated with epispadias and exstrophy of the bladder; but in rare instances there may be only a failure of union between the pubic bones and a separation of the abdominal wall immediately above the symphysis.

Treatment.—The division of the clitoris has no clinical significance. The exstrophy of the bladder, the separation of the abdominal wall, and the epispadias are cured by the usual operative procedures.

Adherent Prepuce.—Adhesions between the prepuce and the glans are not infrequently met, and they are very apt to produce reflex symptoms similar to those in the male.

Treatment.—The treatment consists in breaking up the adhesions and keeping the surfaces apart until healing takes place (see p. 205).

Redundant Prepuce.—A large, flabby, redundant prepuce is occasionally met in children. These individuals are apt to form the habit of masturbation on account of the local irritation which is produced, and unless the deformity is relieved by operative measures a serious neurotic condition may develop.

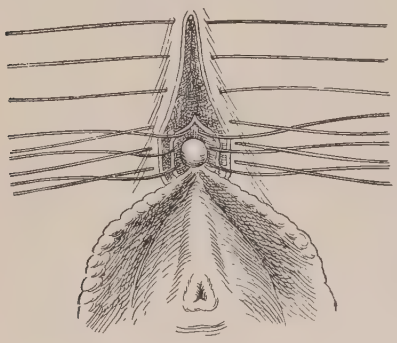


FIG. 169.—Third Step.

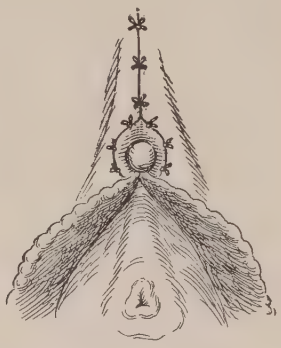


FIG. 170.—Fourth Step.

OPERATION FOR REDUNDANT PREPUCE.
Fig. 169, Sutures in place; Fig. 170, sutures tied.

Treatment.—The treatment consists in the excision of the redundant skin and the approximation of the raw edges with sutures.

Operation.—A general anesthetic should be employed. The prepuce is seized on each side of the glans with forceps and divided with a pair of straight scissors along the dorsum of the clitoris (Fig. 167). Each half of the divided prepuce is then removed with scissors and the raw surfaces covered over by uniting the edges with interrupted catgut sutures (Figs. 168, 169, and 170).

THE LABIA MINORA.

The following malformations have been met with:

Absence of the labia.
Rudimentary labia.
Hypertrophy of the labia.
Adherent labia.
Multiple labia.

Absence of the Labia; Rudimentary Labia.—In rare instances the nymphæ have been found to be absent, and in exceptional cases they may be rudimentary in character, consisting of slight elevations of skin along the sides of the vulvar cleft.

Hypertrophy of the Labia.—A slight enlargement of the labia minora is not an uncommon defect and even a decided hypertrophy may be occasionally observed. Among the Hottentots the nymphæ are normally very much hypertrophied and hang down between the thighs for a distance of seven or eight inches, forming the so-called "*Hottentot apron.*" An enlargement of the labia minora is usually of no clinical importance unless it causes local irritation or mechanically interferes with sexual intercourse.

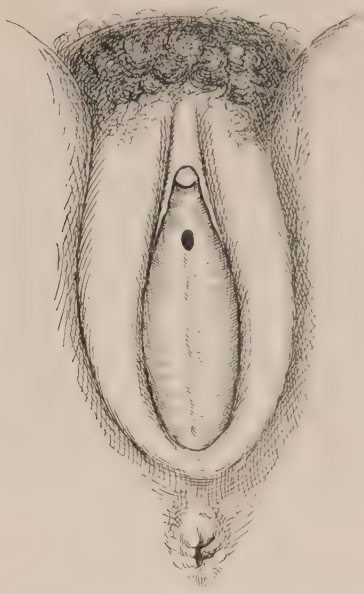


FIG. 171.—ADHERENT LABIA (page 158).

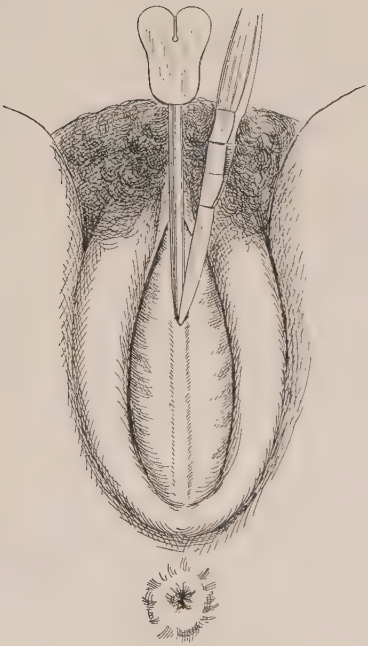


FIG. 172.

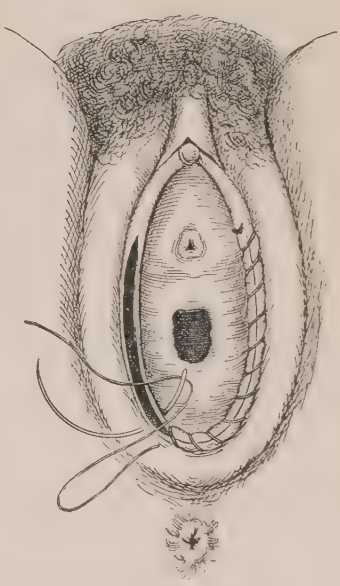


FIG. 173.

OPERATION FOR ADHERENT LABIA (page 158).

Fig. 172, Division of the adhesions; Fig. 173, raw surfaces being united.

Treatment.—The redundant tissue is removed with scissors and the edges of the wound united with interrupted catgut sutures.

Adherent Labia.—When epithelial coalescence occurs during fetal life between the labia, it gives rise to a deformity known as "apparent vulvar atresia," or *atresia vulvæ superficialis*. In the vast majority of cases the union is incomplete and there is a small opening left anteriorly through which the menstrual blood and urine escape. If, however, the atresia is complete, the newborn child is unable to micturate and the deformity demands immediate relief. The malformation necessarily interferes with sexual intercourse, although impregnation is not rendered impossible, and the small size of the vulvovaginal orifice may offer a serious obstruction to childbirth (Fig. 171).

Treatment.—A grooved director is introduced through the opening and the tissues divided in the median line with a scalpel. If the raw surfaces resulting from the division are extensive, the wound on each side is closed with a continuous catgut suture; otherwise the parts are kept separated with a strip of gauze which should be renewed daily until the healing is completed (Figs. 172 and 173).

Multiple Labia.—Sometimes the nymphæ are increased in number by longitudinal divisions, occurring during fetal life, which result in the formation of several folds of skin in place of the development of a single labium.

THE LABIA MAJORA.

The following malformations have been met with:

Absence of the labia. Hypertrophy of the labia.
Rudimentary labia. Multiple labia.
Abnormal situation of the labia.

Absence of the Labia; Rudimentary Labia.—Cases have been observed in which the labia have been absent or rudimentary in character without the vulva presenting any other evidences of an undeveloped state. These instances are very rare, however, and, as a rule, the labial malformations are combined with a rudimentary condition of the vulva as a whole.

Hypertrophy of the Labia; Multiple Labia.—The labia majora may be enlarged or increased in number. Hypertrophy of the labia is not an uncommon deformity, and occasionally cases are observed in which the organs are increased in number by cleavage occurring during fetal life.

Abnormal Situation of the Labia.—Sometimes the labia majora are abnormally situated and they extend as far back as the anus. Under these circumstances the nymphæ may or may not be involved in the deformity.

THE HYMEN.

According to Tourneux and Legay, the hymen is developed from a small mass of epithelial cells which appear about the end of the fourth fetal month on the posterior wall of the urogenital sinus at the point where the now united ducts of Müller join the sinus. The vaginal part of the united Müllerian ducts, the primitive vagina, is not pervious at this time, its lining epithelial cells completely filling it as a plug. In the succeeding months the vagina acquires its lumen, and the lower part of its ventral wall, corresponding to the site of the anlage of the hymen, breaks down, thus affording communication with the urogenital sinus. The urogenital sinus is now become the vestibule of adult anatomy, and the vagina, in common with the urethra, opens into the vestibule, and thus it results that the hymen, situated at and partly closing the vaginal orifice, is continuous by its outer surface with the vestibule and by its inner surface with the vagina. In fact, the deeper of the two lamella of which the hymen is said to consist is,

according to Tourneux, the extreme lower part of the anterior vaginal wall, which folds against and adheres to the wall of the urogenital sinus during the course of the lateral enlargement of the canal in fetal life.

The following anomalies of the hymen have been noted:

Absence of the hymen.
Rudimentary hymen.
Abnormal openings in the hymen.
Anomalies in structure and shape.
Imperforate hymen.

Absence of the Hymen.—The hymen is found lacking only in very rare instances.

Rudimentary Hymen.—Sometimes the development of the hymen may be defective and its presence merely marked by several small elevations or ridges at the outlet of the vagina.

Abnormal Openings in the Hymen.—The following abnormal openings have been observed:

Hymen biforis or *bifenestratus*, in which there are two openings placed side by side with a broad septum between them. *Hymen septus*, in which there are

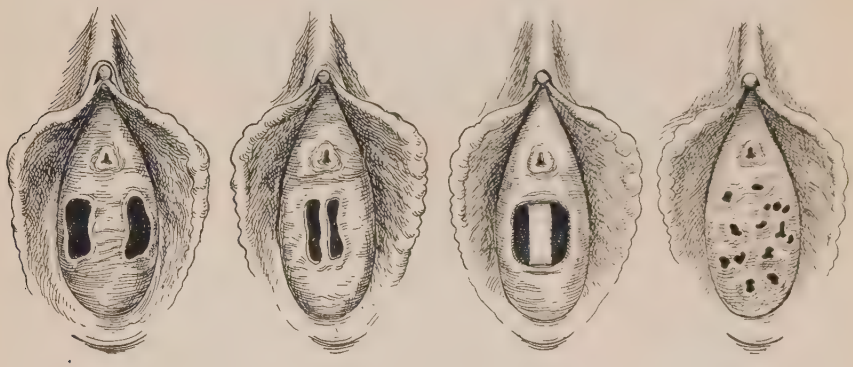


Fig. 174. Fig. 175. Fig. 176. Fig. 177.

Abnormal Openings in the Hymen.

Fig 174, Hymen biforis; Fig. 175, hymen septus; Fig. 176, hymen subseptus; Fig. 177, hymen cribriformis.

two openings separated by a narrow septum. *Hymen subseptus*, in which the opening is partially filled by a septum that grows either from the anterior or posterior surface of the hymen and is thinner than the membrane itself. *Hymen cribriformis*, in which the membrane has several small openings.

Anomalies in Structure and Shape.—In some instances the hymen may be so thick and resistant that it cannot be ruptured in attempted sexual intercourse, and vaginismus may result from local irritation caused by the ineffectual efforts. In others the membrane may be so yielding or elastic that it is not ruptured during intercourse, and cases have also been noted in which it remained unbroken after the birth of a child at term.

The shape of the hymen is often changed, and in place of the usual crescent-like form of the membrane its edges may be serrated (*denticular hymen*), projecting (*infundibuliform hymen*), fimbriated, or irregularly curved (*sculptured hymen*) (Figs. 178, 179, 180, and 181).

Treatment.—Malformations in the shape of the hymen are of no clinical significance whatever, but those involving its structure usually demand operative

measures for their relief. These consist in removing the membrane with scissors and uniting the raw edges with interrupted catgut sutures.

Imperforate Hymen.—This malformation, which completely closes the vaginal orifice, is known as *atresia hymenalis*, and is due to the persistence of that

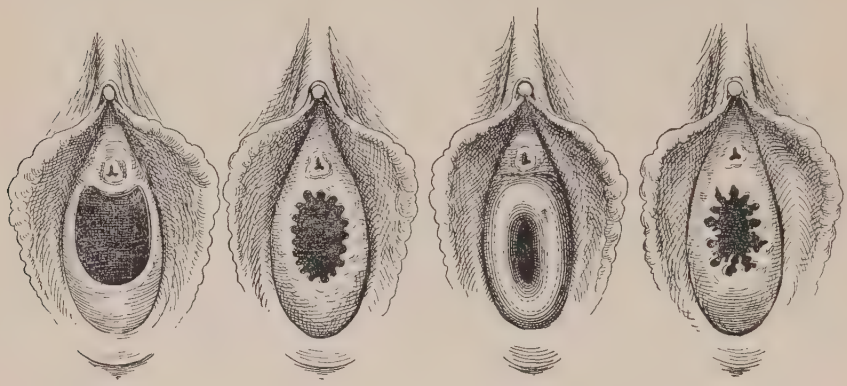


FIG. 178. FIG. 179. FIG. 180. FIG. 181.

ANOMALIES IN THE SHAPE OF THE HYMEN (page 159).

Fig. 178, Crescent-shaped hymen; Fig. 179, denticular hymen; Fig. 180, infundibuliform hymen; Fig. 181, sculptured hymen.

part of the posterior wall of the urogenital sinus which normally breaks down to produce the vaginal outlet, as well as perhaps to the overgrowth of the cells referred to above as the anlage of the hymen.

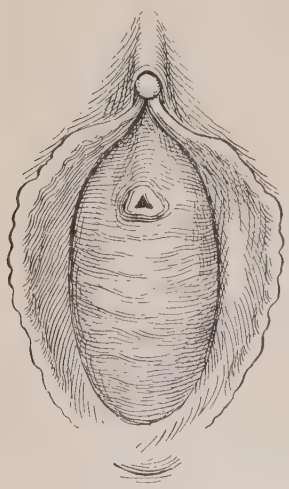


FIG 182.—IMPERFORATE HYMEN.

Course.—Prior to puberty the anomaly does not, as a rule, cause any local or general disturbance, but in exceptional cases, however, there may be an extraordinary amount of mucus secreted, which, being unable to escape from the vagina, eventually causes distention and results in the development of a fluctuating pelvic tumor. This tumor bulges at the vulvovaginal orifice, and if it attains to a considerable size, may cause more or less interference with defecation and micturition.

In the vast majority of cases the anomaly begins to cause trouble only at the time of puberty, owing to the fact that the menstrual blood is then obstructed by the atresia and cannot escape from the vagina. In time the vagina becomes distended (*hematocolpos*), then the uterus (*hematometra*), and finally the Fallopian tubes (*hematosalpinx*).

The muscular coats of the vagina, the uterus, and the tubes also undergo more or less hypertrophy, and the hymen itself becomes thickened.

The cervix is usually dilated with menstrual blood before the body of the uterus is involved, and, as a rule, there is no communication between the tubes and the uterine cavity, the hematosalpinx being due to the blood which comes directly from the tubal mucous membrane.

The size of the tumor depends upon the quantity of the retained blood, and

after the individual has menstruated for a considerable length of time a large fluctuating mass may be felt filling up the pelvic cavity and extending into the abdomen. Under these circumstances the bladder and the rectum are encroached upon and their function more or less interfered with. The retained blood in time loses its fluid character and becomes thick, very tenacious, and tarry in consistency, and of a dark brown or almost black color. Sometimes the retained blood becomes infected, and it assumes a purulent character which produces a *pyocolpos*, a *pyometra*, or a *pyosalpinx*. Under these conditions general sepsis is likely to follow and the life of the patient is placed in immediate jeopardy. Again, overdistention may cause rupture of the vagina, the uterus, or the tubes, and a general peritoneal inflammation may develop.

Symptoms.—During childhood, as a rule, no symptoms develop unless the retained mucus is in sufficient quantity to cause trouble, in which case the patient complains of fullness and weight in the pelvis along with more or less vesical and rectal irritation.

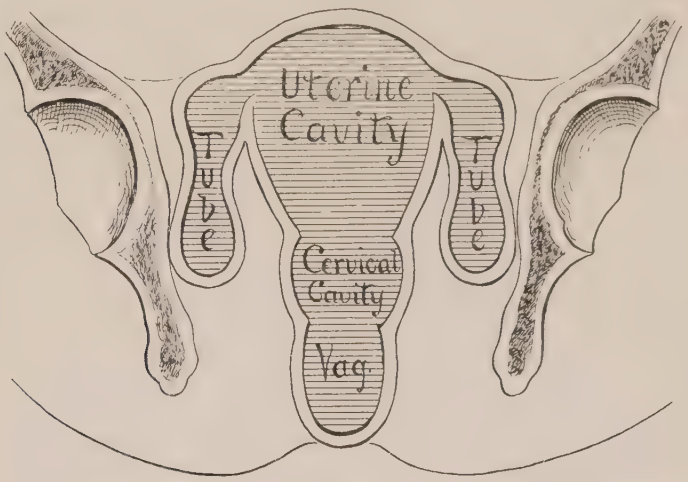


FIG. 183.—HEMATOCOLPOS, HEMATOMETRA, AND HEMATOSALPINX CAUSED BY AN IMPERFORATE HYMEN.

The malformation does not retard or interfere with the normal physical and psychic changes that take place at puberty, and, as a rule, amenorrhea is the first symptom that calls attention to the local trouble. The menstrual molimen occurs without the appearance of the flow, and as the pent-up blood increases in amount, colicky pains recur with increasing severity each month along with a sense of fullness in the pelvis. There is also more or less interference with micturition and defecation, and not infrequently a vicarious hemorrhage takes place from the nose, the rectum, or the bladder. If the genital organs rupture or the retained fluid becomes infected, symptoms of peritonitis or of sepsis intervene and obscure the true character of the local condition.

In rare instances the presence of the anomaly is not suspected until the patient marries and finds that sexual intercourse cannot be accomplished. The absence of previous symptoms in these cases is probably due to the fact that marriage occurred early, or puberty was delayed, or there had been a scanty flow; in any event, the amount of retained blood was not sufficient to cause marked local disturbances.

Diagnosis.—The history of the case is significant and the malformation should be suspected when the physical and psychic changes of puberty occur without the appearance of menstruation, especially when a well-marked menstrual molimen is present. A positive diagnosis, however, is based upon a physical examination, which should always be insisted upon when a young woman passes the period of puberty and exhibits symptoms of genital obstruction.

Inspection reveals an elastic tumor occluding the entrance of the vagina, which becomes very tense and projects considerably beyond the vulvar canal when the patient bears down or strains.

Recto-abdominal palpation elicits the presence of a fluctuating mass occupying the pelvic cavity and extending beyond the symphysis pubis in cases in which a large amount of menstrual blood has accumulated. The situation and size of the tumor renders palpation of the tubes difficult or impossible, and their exact condition can therefore seldom be determined even when an anesthetic is employed.

Prognosis.—Without surgical interference the prognosis is bad and the malformation may eventually cause rupture or septic infection. The distention and hypertrophy of the tubes which are associated with the condition may result in a permanent destruction of their function, and sterility may continue after the removal of the cause.

Treatment.—The treatment consists in removing the obstruction and draining away the retained fluid.

Operation.—The patient is anesthetized and placed in the dorsal position. A small opening is then made in the most prominent part of the bulging membrane and the menstrual blood allowed to drain away slowly, without making any pressure over the tumor, in order to guard against tubal rupture, which might possibly occur if the contents of the vagina or the uterus were suddenly evacuated. After a considerable quantity of the retained blood has drained away and the tension is relieved, the opening is enlarged by a crucial incision. The vagina is then flushed with a warm solution of bicarbonate of soda (℥ss to the quart) in order to dissolve the tarry blood and complete the evacuation. While the irrigation is going on, the index-finger of the left hand is introduced into the vagina and an examination made of the uterus. If the latter organ is found to be distended, the nozzle of the irrigating apparatus is directed into its cavity and the retained blood flushed out. The uterine cavity and the vagina are then douched with a warm solution of corrosive sublimate (1 to 2000), followed by a copious irrigation of normal salt solution, and the vaginal canal loosely packed with a tampon of plain gauze. A gauze compress is then placed over the vulva and secured by a T-bandage.

The tampon is removed in twenty-four hours and the uterine cavity and vagina flushed once a day with a hot solution of corrosive sublimate (1 to 2000), followed by a douche of normal salt solution. A clean gauze compress should be kept constantly applied to the vulva and the patient should not be allowed to get out of bed for at least two weeks.

Special Directions.—The strictest antiseptic precautions must be carried out at the time of operation and during the after-treatment, as septic infection is liable to occur if the slightest error is made in the technic.

The danger of tubal rupture occurring during the evacuation of the retained fluid is, in my experience, greatly overestimated by most authorities, and consequently I am opposed to the removal of the tubes and ovaries if a hematosalpinx is discovered before the obstruction is removed. It is better, under these circumstances, to drain the fluid away slowly and give the tubes a chance eventually to evacuate their contents into the uterus, than to unsex the patient at the start by a mutilating operation.

HERMAPHRODITISM.

The term "*hermaphroditism*," meaning literally the uniting of the two sexes in one organism, is often somewhat loosely employed to describe an individual whose external genital organs partake of the nature of both sexes. The crucial test of sex is not to be found, however, in the condition of the external organs, but is dependent upon the nature of the essential sexual gland or glands present in any given case. If these glands are testes, the sex is male; and if they are ovaries, the sex is female, however much the external genitalia may simulate those of the opposite sex. It frequently happens in cases presenting external organs resembling those of both sexes, that the internal organs or sexual glands will be found to be unisexual. These are, therefore, instances of false or pseudo-hermaphroditism. True hermaphroditism, on the other hand, means the presence of both ovary and testicle on one or both sides, or of an ovary on one side and a testis on the other, whatever may be the condition of the external organs. True hermaphroditism is quite rare. In describing the varieties of hermaphroditism the classification of Klebs will be followed.

True Hermaphroditism or Androgynes.—As stated above, true hermaphroditism consists in the presence of both ovary and testis, or of both ovarian and testicular tissue, in the same individual, and may be theoretically of three types:

Lateral Hermaphroditism, in which there is an ovary on one side and a testicle on the other. An example of this variety in the University of Prague collection shows a testis, epididymis, vas, rudimentary oviduct, and round ligament on the right side, and an ovary, oviduct, and ovarian ligament on the left side, besides uterus, vagina, and prostate. To account for this anomaly one must assume the Wolffian body and duct of one side to have undergone the normal masculine evolution into testis, epididymis, and vas, the Müllerian duct of the same side having only partially developed, while on the other side the Müllerian duct and the indifferent sexual gland developed in the manner normal to the female, the Wolffian duct correspondingly suffering arrest and partial obliteration.

Bilateral Hermaphroditism is understood to mean an ovary and a testis or a compound organ containing both ovarian and testicular tissue on both sides of the body. There is believed to be no well-authenticated human example.

Unilateral Hermaphroditism means the presence of both ovary and testis on one side, but only one kind of organ, either ovary or testis, on the other.

False or Pseudo-hermaphroditism.—In false hermaphroditism the bisexual manifestations are confined to the genital passages and to the external genitals, the sexual glands being always unisexual.

Male False Hermaphroditism.—Testes are always present.

Internal False Hermaphroditism.—There is a rudimentary vagina and sometimes also Fallopian tubes and a uterus. The external organs may or may not be well formed. To produce this condition, the Müllerian ducts have undergone more or less development to evolve those parts of the female sexual apparatus which are present, in addition to the normal evolution of the indifferent sexual gland and the Wolffian body and duct into the testicle and its system of excretory passages.

External False Hermaphroditism.—The bisexual manifestations are limited to the external organs which simulate those of the female. The individual exhibits general female characteristics. There are no ovaries, tubes, uterus, or vagina.

External and Internal or Complete False Hermaphroditism.—The bisexual features may be presented by any parts of the

genital system except the glands, which are always of the male type. Vagina, uterus, and oviducts are sometimes fairly well developed, sometimes rudimentary, the ducts of Müller having undergone, to a greater or less degree, the evolution peculiar to the female. The external genitals, owing to defective development, resemble female organs. The genital eminence developing imperfectly produces a small hypospadic penis which resembles a clitoris. The orifice of the urethra is at the base of the defective penis and opens into the vestibule from the fact that the genital folds have failed to unite with each other, by which union the penile urethra is normally formed. The persistent vestibule or apparent orifice of the urethra also leads into the vagina. In other cases the penis is normal in appearance but contains two canals, the urethra and the genital passage.

Female False Hermaphroditism.—This is much less common than the male variety. The ovaries are always present, indicating the true sex of the individual.

Internal False Hermaphroditism.—The external organs are of well-developed female type, the evidences of the apparently bisexual nature of the individual being internal. The Wolffian ducts, instead of producing vestigial structures in the manner normal to the female, undergo partial evolution into rudimentary testicular ducts, which are to be found in the broad ligaments and in the uterine and vaginal walls and occasionally are prolonged to the clitoris.

External False Hermaphroditism.—The hermaphroditism is confined to the external genitals. The clitoris is apt to be so overdeveloped as to resemble a penis, the labia majora may be large and partially united, resembling a scrotum, and the vaginal orifice may be contracted.

External and Internal or Complete False Hermaphroditism.—The external organs resemble those of the male. In one reported case there was a prostate; in another, a prostate pierced by the vagina, while an ejaculatory duct and a sac resembling a seminal vesicle opened into the vagina.

WOUNDS OF THE VULVA.

Causes.—The situation of the vulva protects it in a measure from the more common forms of injury to which the rest of the body is exposed. Wounds in this region, however, are serious and liable to be followed by severe or even fatal hemorrhage or septic infection. This is accounted for by the great vascularity of the parts and the relative situation of the vulva and the rami of the pubis and ischium, which cause extensive and dangerous wounds when the soft tissues are suddenly forced against the bony structures by direct violence.

Labor.—This is the most frequent cause, and the tissues may be contused or lacerated during the delivery of the child, the application of the forceps, or other obstetric operations. The perineum is the most common seat of injury, and next in point of frequency are the nymphæ, which may be torn in a diagonal or transverse direction; these tears, however, are seldom serious. The labia majora are more often contused than lacerated, although superficial tears are quite common, and in some cases there may be a severe injury involving the vulvovaginal glands. Dangerous or even fatal hemorrhage may result from tears of the vestibule near the clitoris.

Direct Violence.—As previously mentioned, wounds from direct violence are particularly dangerous on account of the anatomic arrangement of the structures of the vulva, and a traumatism even with a blunt instrument may cause an incised wound by forcing the soft tissues against the narrow edge of the rami of the pubis and ischium. Injuries from direct violence may be due to falling astride of an object, or to kicks or blows. Many cases have been

reported from time to time of severe and even fatal injuries from these causes. Women have fallen across the back of a chair, the edge of a table, or a fence picket, and they have also been thrown from the saddle of a bicycle onto the handle-bars or frame. In the majority of these cases the wound corresponded with the position of the rami of the pubis and ischium, involving the nymphæ, the clitoris, and the vestibule, and was attended with excessive bleeding. Wounds resulting from blows or kicks are usually situated in the labia majora. Children have been injured by splinters of wood penetrating the vulva while sliding down an inclined board, or by being violently thrown from a sled against an object while coasting. Winckel reported the case of a woman who was attacked by a bull and seriously injured in the vulva and perineum by his horns.

Coitus.—Injuries of the vulva from sexual intercourse are rare. During the first intercourse the hymen is ruptured, but the bleeding is very slight and of no consequence. Occasionally, however, the hemorrhage may require surgical interference. In cases of rape upon young girls extensive lacerations may be produced. A child of about nine years of age, who came under my observation,

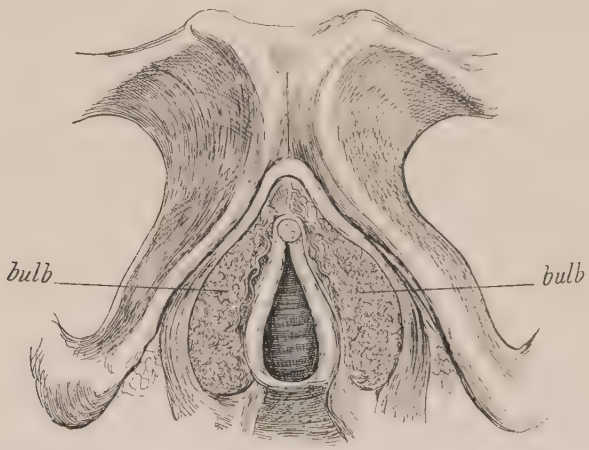


FIG. 184.—VESTIBULOVAGINAL BULBS.

upon whom a rape had been committed was badly lacerated in the perineum and on each side of the vulvovaginal orifice; the tears extending into the labia.

The lacerations which are produced by sexual intercourse with young girls are due to the disproportion in size between the genital organs and to the tender condition of the undeveloped structures of the vulva and vagina. Lacerations may occur during intercourse with old women on account of a want of elasticity of the parts due to senile atrophy or to the changes occurring in kraurosis vulvæ.

Symptoms.—Local Symptoms.—These are: (1) Pain; (2) hemorrhage; (3) impaired function; (4) retraction of the edges of the wound.

P a i n.—At the time of the injury the pain is acute and sharp; but it soon becomes dull or smarting in character, and after a few hours it disappears entirely unless inflammation occurs or the parts are not kept at rest. In some cases pain is not felt at the moment of receiving the injury, owing to excitement or to other mental causes.

H e m o r r h a g e.—In wounds of the vulva, especially those of the vestibule, the clitoris, or the nymphæ, the hemorrhage is continuous and excessive and may

even rapidly become fatal. This is due to the great vascularity of the parts and to the severe character of the traumatism, which is caused by the soft tissues of the vulva being driven, at the moment of the injury, against the sharp edges of the rami of the pubis and ischium.

Impaired Function.—Wounds of the vulva, as in other parts of the body, result in loss of function. The swelling, pain, and tenderness interfere with locomotion and sexual intercourse, and in some cases the distention of the parts acts as a mechanic obstruction and prevents urination or even defecation.

Retraction of the Edges of the Wound.—While there is always some gaping in wounds of the vulva, it is not so marked as in other parts of the body on account of the character of the tissues and the lateral pressure which is exerted upon the seat of injury by the surrounding structures.

Constitutional Symptoms.—These are: (1) Shock; (2) fat embolism.

Shock.—Severe wounds of the vulva are apt to be attended by shock, especially those which are caused by great violence, such as falling from a height astride upon an object. Women, as a rule, suffer less constitutionally from injuries than men, and young girls generally recover rapidly from shock when there has been no great loss of blood. Old people, who have no organic lesions, bear injuries well so far as their effect upon the nervous system is concerned. The tendency to shock is always more or less influenced by the habits, the environment, the temperament, the mental condition, and the health of the patient.

Fat Embolism.—The possible occurrence of fat embolism following wounds of the vulva should not be overlooked. The condition is due to the entrance into the circulation of the fluid fat of the tissues and its deposition in the lungs, the brain, the spinal cord, the liver, or the kidneys. Fat embolism is liable to follow crushing injuries involving bone or adipose tissue. Should the fat-globules contain septic micro-organisms, pyemia will likely result.

Complications.—The healing of a wound may be interfered with by suppuration, gangrene, erysipelas, or tetanus, and septicemia or pyemia may result.

Treatment.—The treatment is considered under the following headings: (1) Hemorrhage; (2) shock; (3) cleansing the wound; (4) coaptation of the edges of the wound; (5) drainage; (6) dressings; (7) rest; (8) general treatment.

Hemorrhage.—Digital pressure or a compress held in position with a T-bandage will control the bleeding until more permanent means are applied. When using the finger or a compress, care should be taken to crowd the wounded tissues against the rami of the pubis or ischium, otherwise the bleeding will not be controlled. In slight wounds a compress is all that will be required to permanently check the hemorrhage. In some situations of a wound it is necessary to tampon the lower end of the vagina in addition to placing a compress directly over the seat of injury. Injuries of the vulvovaginal orifice, including lacerations of the hymen, are examples of wounds requiring a vaginal tampon. Free or persistent capillary oozing may often be controlled by the removal of the blood-clots and exposure of the wound to the air for a few minutes, or by the use of compresses wrung out of hot water and pressed against the bleeding surfaces. Capillary oozing is generally checked by the gauze which is used in packing the wound when the dressings are applied. Cold should not be employed as a hemostatic agent, at it interferes with the processes of repair by its lowering effect upon the nutrition of the parts, and styptic agents should not be applied, as they destroy the vitality of the tissues and increase the danger of infection. Bleeding from small vessels may be permanently controlled by hemostatic forceps if the compression is continued for a few minutes, or torsion may be tried if the bleeding persists after they are removed. Large vessels and all points which

continue to bleed should be ligated with catgut, which is preferable to silk on account of its absorbability.

Shock.—(See Treatment of Shock, p. 859.)

Cleansing the Wound.—All foreign substances, blood-clots, and devitalized tissue must be removed with forceps, curet, scissors, or gauze sponges, and the wound thoroughly irrigated with hot sterile water. The hair is then cut close, the surrounding surfaces washed with liquid soap, and the wound irrigated with a solution of corrosive sublimate (1 to 1000).

Coaptation of the Edges of the Wound. The skin and underlying tissues are closed with interrupted sutures of silk, silkworm-gut, or catgut. The latter is preferable in slight wounds of the vulva, but in the deeper ones or where there is more or less tension silkworm-gut is the best suture to employ.

Drainage.—The necessity for drainage depends upon the character of the wound and its freedom from septic infection. A clean-cut incised wound requires no drainage, as healing occurs by primary union after the edges are brought together by sutures. On the other hand, lacerated and contused wounds require drainage, as the secretions are too profuse to be absorbed and provision must also be made for the escape of necrotic tissue.

The indications for drainage must be carefully studied in each case to obtain the best results, and in some instances the wound must be enlarged to give free vent to the secretions. Again, counter-openings may be necessary, and finally the wound may be left open at its most dependent part for drainage. In wounds of the vulva we may employ rubber tubing, gauze, and strands of silkworm-gut or horsehair for drainage material. In large, deep, and infected wounds rubber tubing offers the best means at our disposal for the free and continuous discharge of the secretions, as it is flexible and readily adapts itself to changes in position. Glass tubes should never be used in wounds of the vulva. Capillary drainage by means of strands of silkworm gut or horsehair is indicated in wounds which are closed by sutures but where it is unsafe to trust the absorption of the secretions to nature.

Dressings.—Wounds which are closed with sutures should be protected with a gauze compress and a T-bandage applied. Wounds which remain open and heal by granulation should be packed with gauze over which is placed plain sterile gauze and the whole held in position by a T-bandage.

The dressings should be changed once or twice daily on account of the situation of the vulva and its exposure to the contact of urine and feces. When the dressings are changed in closed wounds, the parts should be douched with a solution of corrosive sublimate (1 to 1000) and thoroughly dried; open wounds should be irrigated with hydrogen peroxid followed by the solution of bichlorid of mercury. The separation of sloughs is aided by cutting them away with scissors and exuberant granulations are removed with the solid stick of nitrate of silver.

Rest.—The surgical principle underlying rest in the treatment of wounds must not be lost sight of in injuries of the vulva. Rest in bed with the use of the bed-pan is of first importance, as it lessens hemorrhage, serous effusion, irritation, and pain, and hastens the normal processes of healing and repair. The patient should be placed in the most comfortable position, with the thighs slightly separated and the knees elevated.

General Treatment.—The pain and general restlessness are relieved with opium; the bowels are moved with a saline and then kept regular with a mild laxative or an enema; the patient is given nourishing and easily digested food; and the bedroom is well ventilated. The general condition of the patient must also receive attention and all pathologic conditions which interfere with the

healing of the wound or add to the constitutional dangers of the injury must be carefully treated.

Classification.—Wounds of the vulva, as in other parts of the body, are divided into:

1. Subcutaneous wounds or contusions.
2. Open wounds.
   (*a*) Incised.
   (*b*) Lacerated.
   (*c*) Punctured.
3. Aseptic and septic wounds.

SUBCUTANEOUS WOUNDS.

Definition.—A subcutaneous wound is a bruise or contusion caused by a blunt object in which the skin is apparently uninjured, but in which the underlying tissues are more or less destroyed. When the bleeding from the ruptured blood-vessels is diffuse, subcutaneous discolorations or *ecchymoses* are formed; but when the effused blood is circumscribed, it is known as a blood tumor or *hematoma.*

Symptoms.—The parts become tender, painful, swollen, and discolored. In superficial contusions the discoloration of the skin occurs at once, but it may be delayed for several days when the deeper structures are involved. The subcutaneous effusion of blood results in ecchymosis or hematoma or both, and the swelling and tenderness may interfere with coitus, locomotion, or urination. A greater or lesser degree of shock may be present.

Treatment.—In slight contusions lead-water and laudanum should be applied to the wound. The application of an ice-bag is useful when employed soon after the injury is received; it is contraindicated, however, in severe contusions or in old and debilitated women, as the continued application of cold depresses the vitality of the parts and endangers their integrity. After the swelling, pain, and inflammation have subsided, tincture of arnica or distilled extract of witch-hazel may be substituted for the lead-water and laudanum or ice-bag. The subcutaneous effusion of blood in superficial contusions seldom goes beyond the formation of a few spots of discoloration or ecchymosis, and requires no special attention.

In severe contusions heat should be applied to the vulva by means of a hot-water bag or a hot solution of lead-water and laudanum. These applications should be discontinued after the acute symptoms have subsided and tincture of arnica or distilled extract of witch-hazel substituted.

If suppuration occurs, a free incision must be made and the pus evacuated. The wound is then irrigated with hydrogen peroxid, followed by a solution of corrosive sublimate (1 to 1000), and packed with gauze. It is then covered with a gauze compress, which is held in position with a T-bandage. The wound should be dressed twice a day until it heals by granulation.

As a rule, hemorrhage is not excessive in subcutaneous wounds, and is readily controlled by a compress and T-bandage, but at times the bleeding may be so persistent as to require surgical interference. Under these circumstances a free incision must be made, the bleeding vessels ligated, and the wound irrigated, packed, and dressed as described above in the treatment after the evacuation of pus. Exuberant granulations are removed with the solid stick of nitrate of silver.

INCISED WOUNDS.

Definition.—An incised wound is a clean cut inflicted by a sharp instrument, which heals, as a rule, by primary union.

Symptoms.—The edges of the wound gape, the hemorrhage is profuse, and the pain, which is sharp and acute at first, soon subsides into a smarting sensation.

Treatment.—Hemorrhage.—Bleeding is easily controlled, when only small vessels are divided, by the application of hot water and compression, and it is permanently checked when the wounded surfaces are brought into apposition with sutures. Large vessels require ligation. If a large vessel is only partially cut through, it is sometimes difficult to place a ligature around it, and it may be necessary to enlarge the wound before the hemorrhage can be checked. Styptic agents should not be applied, as they interfere with repair by destroying the vitality of the tissues and increasing the dangers of infection.

Cleansing the Wound.—The hair should be cut close and the surrounding surfaces washed with liquid soap and the wound irrigated with normal salt solution followed by a solution of corrosive sublimate (1 to 1000).

Apposition of the Edges.—The wounded surfaces should be brought into direct contact by deep interrupted sutures, using care not to leave any pockets or dead spaces for the collection of blood or secretions.

Drainage.—If the wound is clean-cut and aseptic, no drainage, as a rule, is required, provided the suturing has been properly done; but it may be necessary, however, in some cases to use drainage for the first twenty-four or forty-eight hours. Nothing is better for this purpose than capillary drainage by means of a few strands of silkworm-gut or horsehair, which are placed in the bottom of the wound and their free ends brought out at each angle of the incision.

Dressings.—The wound should be covered with a gauze compress held in position with a T-bandage, and the dressing removed every day and the parts washed with a solution of corrosive sublimate (1 to 1000).

LACERATED WOUNDS.

Definition.—A lacerated wound is one in which the tissues are torn apart; when they are also crushed, the wound is spoken of as being contused. These wounds slough and heal by granulation.

Symptoms.—The skin and underlying tissues are torn, lacerated, and crushed, and the edges of the wound are irregular. Severe wounds of this nature are usually associated with pronounced shock, while the primary hemorrhage is generally slight owing to the weakened heart action and the lacerated condition of the blood-vessels, which favors the formation of clots. Excessive intermediate hemorrhage, however, may occur when reaction from shock sets in, or a secondary hemorrhage may result when the vessels are reopened by the separation of the sloughs. The pain is not acute, but the wound feels tender and there is a sensation of soreness in the surrounding parts. After the necrotic tissue and sloughs are thrown off, the wound heals by granulation; septic infection is liable to occur.

Treatment.—Cleansing the Wound.—The hair should be cut close and the surrounding surfaces washed with liquid soap. All foreign material, dirt, blood-clots, and devitalized tissue are then removed and the wound irrigated with normal salt solution followed by a solution of corrosive sublimate (1 to 1000).

Hemorrhage.—The greatest care must be taken to guard against intermediate and secondary hemorrhage. All lacerated vessels of any size must be ligated, whether they are bleeding at the time or not, to guard against hemorrhage occurring during the period of reaction from shock. The wound should be carefully watched during the separation of sloughs, as fatal bleeding may occur at that time from the reopened vessels. The compression exerted by the dressings controls the oozing from the smaller vessels and to a certain extent prevents a sudden and dangerous hemorrhage.

Drainage.—The gauze packing used in dressing the wound, as a rule, accomplishes all that is required for purposes of drainage. In some cases, on account of the situation or character of the injury, it is necessary to make counter-openings and use rubber tubing for drainage. The surgeon must always be guided by the indication in each case, making counter-openings either into the vagina, the perineum, or in different parts of the vulva as in his judgment may seem best.

Dressings.—After the wound has been cleansed and sterilized and the bleeding checked it should be packed with gauze, over which is placed a gauze compress, and the whole held in place with a T-bandage. The dressings should be changed once or twice a day according to the indications and the wound irrigated with hydrogen peroxid followed by a solution of corrosive sublimate (1 to 1000). When the process of sloughing begins, it should be aided by the application of antiseptic fomentations. The best method of applying fomentations is to lay over the wound a compress of gauze saturated with a hot solution of corrosive sublimate (1 to 1000), and then a piece of rubber-dam, against which is placed a hot-water bag to keep up the warmth. Exuberant granulations are removed with the solid stick of nitrate of silver.

PUNCTURED WOUNDS.

Definition.—A punctured wound is one in which the injury is produced by a more or less pointed instrument penetrating the tissues. These wounds heal promptly if the object causing the injury is sharp and aseptic, but if the tissues are lacerated or infected by a blunt, irregular, or unclean instrument, septic inflammation results and suppuration follows.

Symptoms.—The pain, as a rule, is sharp and acute. The hemorrhage is generally slight in punctured wounds in many parts of the body, but those of the vulva are liable to bleed profusely. Infection followed by suppuration is likely to occur.

Treatment.—Cleansing the Wound.—It is very difficult to clean and sterilize the wound thoroughly. If, however, the injury has been inflicted by a sharp, smooth, and comparatively clean object, the hair about the injury should be cut close and the parts washed with liquid soap and douched with a solution of corrosive sublimate (1 to 1000). When the tissues are lacerated and contused, the wound must be enlarged by a free incision and treated as a lacerated wound.

Hemorrhage.—In small punctured wounds the hemorrhage may often be controlled by a compress and T-bandage. When, however, it is unsafe to trust to this method, the wound must be enlarged and the injured vessels ligated.

Drainage.—Small clean-cut punctures require no drainage. Lacerated and contused punctures must be enlarged by a free incision, and in some cases counter-openings must be made and drainage established by means of gauze packing or rubber tubing or both.

Dressings.—A simple clean puncture should be covered with a gauze compress, which is held in position with a T-bandage. The dressing should be changed twice daily and the parts washed with a solution of corrosive sublimate (1 to 1000). The dressings for a lacerated puncture are the same as those described for lacerated wounds.

DISEASES OF THE VULVA.

HEMATOMA.

Definition.—A circumscribed swelling due to the effusion of blood in the connective tissue.

Causes.—Varicose veins and pregnancy are *predisposing causes.*

The *exciting causes* are: (1) Labor; (2) traumatism; (3) muscular effort.

Labor.—The affection frequently occurs from the pressure of the child's head during labor, or the rapid dilatation of the soft parts in precipitate delivery and injury to the veins during the application of the forceps or other obstetric operations.

Traumatism.—In the non-pregnant state a hematoma has been caused by direct violence, such as a kick, falling astride of an object, or an injury during an operation.

Muscular Effort.—Straining at stool or heavy lifting has been followed by the rupture of a varicose vein and the subsequent formation of a blood tumor.

Subjective Symptoms.—As a rule, the tumor appears suddenly, accompanied by more or less intense pain, followed in a short time by a feeling of fullness; in some cases there is rectal and vesical tenesmus, and later on pruritus. When the tumor is very small, the patient may not be conscious of its existence. Should the hematoma suppurate, symptoms of vulvar abscess intervene.

Objective Symptoms.—The tumor is usually situated in one of the labia majora, although it may be found in any part of the vulva. In the non-pregnant state the tumor is small, rarely becoming larger than a hen's egg; but when it occurs during childbirth, it may reach the size of a fetal head and extend into the vagina and beyond the outer border of the vulva. The tumor is globular in shape, elastic in consistency, purple in color, and often tender to the touch. In some cases small ecchymoses are observed in the surrounding tissue.

Results and Prognosis.—A hematoma may be absorbed, encapsulated, or undergo suppuration. If it becomes encapsulated, the sac contains either blood or a clear fluid. The prognosis in the non-pregnant state is favorable, as the tumor is usually small and yields readily to treatment. During labor, however, it is a grave complication, as it may interfere mechanically with labor, endanger the patient's life from hemorrhage, or produce puerperal sepsis.

Treatment.—In the non-pregnant state the tumor should be opened, the clots turned out, and the cavity washed with a solution of corrosive sublimate (1 to 1000) and closed with deep sutures or packed with gauze. If it has become encapsulated, the sac should be extirpated and the wound closed in the same manner. When suppuration occurs, the hematoma should be treated as a vulvar abscess (see p. 180).

The treatment during labor is to open the tumor, turn out the clots, and wash the cavity with a hot solution of bichlorid of mercury (1 to 1000), and pack it with gauze. While the hemorrhage is usually controlled by the packing, it may be necessary in some cases to locate the bleeding point and place forceps or ligatures upon the injured vessels.

A hematoma of the vulva should never be trusted to nature, as it is peculiarly liable to undergo suppuration because of its proximity to the vagina and rectum and the irritation to which it is exposed during sexual intercourse and in walking. Furthermore, when it occurs during labor, the tissues of the vulva are bruised and their powers of resistance lessened; consequently absorption is not likely to take place.

It is not advisable to close the cavity with sutures, after turning out the clots, of a hematoma occurring during labor, for the reason that the bruised condition of the tissues prevents primary union.

GANGRENE.

Definition.—Gangrene or mortification is death of a part of the vulva in mass.

Causes.—Traumatism.—The affection may be caused by injury during labor, especially when the vitality of the tissues is impaired by edema or extravasation of blood. Chemic agents may also produce the same results, and cases of gangrene have been reported following the use of vaginal tampons or vulvar compresses containing strong corrosive remedies. Direct violence, such as a kick or falling astride of an object, has resulted in serious injury followed by mortification.

Infection.—Erysipelas, diphtheria, and puerperal septicemia are causes.

Overdistention of the Tissues.—The vitality of the tissues may be destroyed by overdistention from edema, dependent upon heart or kidney disease, and from subcutaneous extravasation of blood in cases of large hematomata of the vulva.

Eruptive Fevers.—Gangrene of the vulva may occur during the course of an attack of typhus or scarlet fever, measles, or smallpox.

Diathesis and Environment.—Under the name of *noma pudendi* gangrene of the vulva may occur in weak, strumous children living under bad hygienic surroundings. The disease is due to an infection and is considered to be infectious.

Symptoms.—The disease usually begins in one of the labia majora with severe local pain and elevation of the temperature. A spot of infiltration soon appears which is dark red or black in color, and vesicles or bullæ form upon the surface of the affected part, which rupture and discharge a thin sanious fluid and expose the gangrenous tissue beneath.

Prognosis.—The disease has a high mortality and death may result from septicemia, embolism, or exhaustion. If the patient recovers, the parts are healed in about four weeks, and the normal contour of the vulva is apt to be more or less changed by cicatricial contraction. Noma pudendi is generally fatal.

Treatment.—The treatment is divided into (1) the general and (2) the local.

General Treatment.—The strength of the patient must be sustained by the free use of alcohol in the form of brandy or whisky and by forced feeding with concentrated liquid foods. Strychnin or digitalin should be administered as indications arise.

Local Treatment.—The gangrenous sloughs should be removed by excision with the knife and scissors and the wound thoroughly cauterized with the thermocautery or an 8 per cent. solution of chlorid of zinc. Antiseptic fomentations are then applied or the wound may be continuously irrigated with a solution of bichlorid of mercury (1 to 15,000) until healthy granulations appear. The diseased area is then dressed with iodoform gauze and protected by a compress which is held in position with a T-bandage. The dressings should be changed twice daily and the wound irrigated at the time with hydrogen peroxid followed by a solution of corrosive sublimate (1 to 1000). When it is not advisable to excise the gangrenous tissues on account of the extent of the disease, the affected parts may be completely destroyed by the thermocautery and treated in the same manner as after excision.

SIMPLE CATARRHAL VULVITIS.

Definition.—An inflammation of the vulva characterized by a free discharge.

Causes.—Traumatisms.—The affection may be due to masturbation,

excessive or brutal coitus, rape, irritation of the parts in obese women, blows, falls, and kicks.

Irritations.—Simple vulvitis is often caused by want of cleanliness, especially in hot weather, pediculi pubis, seat-worms, saprogenic microbes resulting from decomposed secretions or urine, abnormal discharges from the uterus, vagina, bladder, or urethra, fecal or urinary fistulas, and malignant disease.

Diathesis.—The strumous diathesis is a predisposing cause, especially in children with unhygienic surroundings.

Varieties.—The disease may be **acute** or **chronic**; the acute form is the more common.

Subjective Symptoms.—In the **acute variety** the patient complains of local irritation or tenderness and pain, or smarting at the time of urination, from the contact of the urine with the inflamed surfaces. The discharge is usually profuse and mucopurulent in character, and it may cause an irritation around the anal region and over the inner surfaces of the thighs. The pain is characteristic of inflammation in other parts of the body, and its severity depends upon the violence of the pathologic processes.

In the **chronic variety** itching and a burning sensation are prominent symptoms. The former may at times be so severe that the patient's life is made useless and her strength exhausted by loss of sleep. The discharge is thinner and less in quantity than in the acute form. The excoriations caused by scratching add still further to the discomfort of the patient, and in fat women the inner surfaces of the thighs and the groins are apt to be inflamed and eroded. If the inguinal glands are involved, the patient complains of pain in both groins.

Objective Symptoms.—In the **acute form** the parts are inflamed and swollen, and although dry at the beginning of the attack they soon become bathed with a profuse secretion. The nymphæ may become edematous. The discharge is generally profuse and mucopurulent in character and the inner surfaces of the thighs and around the anal region show signs of irritation. The discharge often accumulates between the labia, and becoming mixed with pus and smegma has a very offensive odor. The inflammation is not so severe nor is it so likely to invade the adjacent organs as the gonorrheal variety of vulvitis, consequently the ducts of Bartholin, the mucous glands of the meatus, the urethra, and the vagina are seldom affected by an extension of the disease.

In the **chronic form** the inflammation is less marked. There is little or no swelling of the parts, and the discharge, while still mucopurulent, is thinner and less in quantity. Excoriations and abrasions caused by scratching are observed. In fat women the inner surfaces of the thighs and the groins are apt to be inflamed and eroded. In severe cases superficial ulcerations are seen on different parts of the vulva and the papillæ are enlarged and bleed readily. The lymphatics may become inflamed and inguinal adenitis result.

Diagnosis.—The diagnosis, as a rule, is easily made, by the history of the cause, the character of the inflammation and its tendency not to invade adjacent organs, and the absence of a specific microbe.

The differential diagnosis between the gonorrheal and catarrhal forms is of the utmost importance, especially if there is a medico-legal question to decide; and in this connection it must be remembered that strumous children with bad hygienic environment may develop a very severe simple catarrhal vulvitis from want of cleanliness, and that a most careful and thorough examination should be made before deciding that the case is one of gonorrheal origin.

Prognosis.—The disease in its acute form is of short duration and responds readily to treatment. The cause must necessarily affect the prognosis, and if the vulvar irritation is due to malignant disease, little or nothing can be

done unless the disorder can be eradicated. In young girls of a strumous diathesis the course of the disease is more or less protracted, and in the chronic form a guarded opinion must be given as to the time required to effect a cure.

Treatment.—The treatment is divided into (1) the removal of the cause, and (2) the treatment of the disease.

Removal of the Cause.—Traumatisms.—The habit of masturbation or excessive coitus must be corrected. Fat women who suffer from friction in walking should be placed under medical treatment for the obesity and the vulva protected with a pledget of lint. The external organs of generation and the surrounding parts should be washed twice or thrice daily with warm water and castile soap and then gently dried and dusted with a bland powder, such as talcum, cornstarch, or lycopodium.

Irritations.—Want of cleanliness must be corrected, pediculi pubis and seat-worms removed, discharges from the uterus, vagina, urethra, or bladder treated, and fecal or urinary fistulas operated upon.

Diathesis.—The strumous diathesis must be treated upon medical principles and the environment of the patient improved.

Treatment of the Disease.—The **acute form** is treated as follows:

Rest.—Absolute rest in bed is essential, even in mild cases, during the early stages of the disease.

Cleanliness.—The vulva must be frequently douched with hot normal salt solution to remove the secretions and prepare the parts for local medication. The solution must be allowed to flow from the nozzle of a fountain syringe upon the vulva and care must be taken not to force any of the secretions into the vagina. If the local inflammation is severe, a hot sitz-bath taken twice a day will keep the parts clean and relieve the intense throbbing and burning.

Local Medication.—In mild cases the vulva is douched with a warm solution of bichlorid of mercury (1 to 2000 or 5000) and the labia separated by a pledget of lint wet with the sublimate solution. The bichlorid douches are used in every case as a routine plan of treatment, and if the inflammation is severe it is followed by the application of lead-water and laudanum by means of lint compresses placed over the vulva and between the labia. A saturated solution of boric acid may be substituted for the lead-water and laudanum after the acute symptoms have subsided, and later on, when the disease has nearly run its course, the free use of a bland powder dusted over the parts will hasten recovery. The powder should be applied several times daily after cleansing the vulva with warm salt solution and gently drying the parts. The following powders are useful for this purpose: talcum, lycopodium, subnitrate of bismuth, oxid of zinc, and calomel.

The Bowels.—Salines should be freely used in the early stage of the disease. Later on a simple laxative, with the occasional use of a saline, is all that will be required.

The Urine.—The urine should be rendered bland and non-irritating by the free use of pure water. If it is over-acid, liquor potassæ and tincture of belladonna should be given; if it is alkaline, benzoate of sodium or ammonium should be administered.

Diet.—During the acute stage of the diseases soft diet (see p. 111) must be given, and later on it may be gradually changed to a convalescent diet (see p. 114).

In the **chronic form** of the disease the same care and attention must be given to cleanliness, the care of the bowels, and the condition of the urine as in the acute variety. While it is advisable for the patient to be as quiet as possible on account of the irritation produced by friction in walking, it is not necessary for her to remain in bed.

The local treatment consists in douching the vulva twice daily with a solution of bichlorid of mercury (1 to 3000 or 4000) followed by normal salt solution. The parts are then gently dried with absorbent cotton and dusted freely with talcum, subnitrate of bismuth, lycopodium, oxid of zinc, or calomel. Three times a week the entire vulvar surface is painted with a solution of nitrate of silver (gr. x to f℥j). It is always advisable to keep the labia separated with a pledget of lint, which is retained in position by means of a compress and T-bandage.

Lint compresses applied to the vulva soaked in an aqueous solution of argyrol (25 per cent.), acetate of zinc (gr. j to f℥j), sulphate of zinc (gr. ij to f℥j), or sulphate of copper (gr. ij to f℥j) often give good results. Excoriations and erosions are treated with benzoated oxid of zinc ointment and the occasional application of the nitrate of silver solution.

The treatment of the pruritus is considered elsewhere (see p. 184), and inflammations of the urethra, the ducts of the vulvovaginal glands, and the mucous glands of the meatus are discussed under their respective headings.

GONORRHEAL VULVITIS.

Definition.—A specific inflammation of the vulva caused by the gonococcus of Neisser.

It is the most frequent variety of vulvar inflammation, and the disease has a marked tendency not only to involve the external genitals but to spread to neighboring organs. Thus, the infection rapidly extends to the ducts and glands of Bartholin, the urethra, the mucous glands of the meatus, the vagina, the uterus, the tubes, and the peritoneum. The urethra and vagina may be infected at the same time as the vulva, or later by the spread of the disease. The inguinal glands may be involved through the lymphatics and undergo suppuration. After all the acute symptoms have subsided the gonococci may remain in a latent state in the uterus, the vagina, the ducts of the vulvovaginal glands, the mucous glands of the meatus or the urethra, and cause infection in the male. Gonorrheal vulvitis may occur as an epidemic among children living together in hospitals, boarding-houses, or schools. In children the hymen to a certain extent protects the vagina from infection.

Subjective Symptoms.—The symptoms are the same as in the catarrhal form, except that they are more violent. Acute urethritis develops early and there is burning and smarting during urination. Later on if the vulvovaginal glands become involved symptoms of an acute circumscribed inflammation are present. If the inguinal glands become infected, the patient complains of soreness and tenderness in the groins. In young children the temperature may be elevated.

Objective Symptoms.—The symptoms are the same as in the catarrhal form, except that they are more pronounced. The discharge is profuse and purulent and pressure on the urethra is followed by the appearance of a drop of pus at the meatus. If the vulvovaginal glands are involved, all the signs of a localized inflammation are present, with or without pus. The glands in the groins may be enlarged, tender to the touch, and inflamed.

Diagnosis.—The diagnosis is based upon the violence of the local inflammation, especially when it follows a suspicious intercourse. Involvement of the urethra is characteristic, as a rule, of the specific nature of the vulvitis, and inflammation of the inguinal and vulvovaginal glands is also suspicious. The presence of gonococci in the secretions confirms the diagnosis.

Prognosis.—The prognosis must always be guarded, as the tendency of the infection to spread and involve the pelvic organs renders the disease one of

the most dangerous that can attack a woman. The latent form of the disease and its contagious nature must also be borne in mind.

Treatment.—The primary object of the treatment is to destroy the specific nature of the inflammation and prevent its extension. The vagina and vulva are douched two or three times daily with a gallon of corrosive sublimate solution (1 to 2000), followed by a quart of normal salt solution. An aqueous solution of argyrol (25 per cent.) is then applied to the vagina on a cotton-wool tampon and over the vulva on a pledget of lint which is held in position by a compress and T-bandage. In the course of a few days, after the acute symptoms have subsided, the vagina and vulva are painted twice weekly with a solution of the nitrate of silver (gr. xxx to f℥j), and in the meantime the douches are continued twice or thrice daily. Later on, the vulva should be dusted over with talcum, lycopodium, oxid of zinc, subnitrate of bismuth, or calomel, and the douches gradually discontinued.

Attention must be given to the care of the bowels, the character of the diet, and the state of the urine. These subjects have been fully considered under the treatment of simple catarrhal vulvitis.

If the infection involves the neighboring organs, the treatment is based upon the principles laid down under the headings devoted to diseases of these structures. The latent form of the infection must be borne in mind and the presence or absence of the gonococci determined by the microscope before pronouncing the patient cured.

FOLLICULAR VULVITIS.

Definition.—A localized inflammation of the follicles of the vulva.

The disease attacks the pilous, the sebaceous, the sudoriparous, and the mucous glands, and the mucous membrane between the follicles is unaffected by the inflammation. The surfaces of the labia majora, the nymphæ, and the prepuce are more or less covered with small red elevations from the size of a pin-head to that of a small pea. These elevations are the follicles distended with their normal secretions or an accumulation of mucopurulent matter. The removal of a hair is usually followed by a drop of pus. As a rule, if the disease is limited to the inner surfaces of the vulva, the follicles are not distended, although the parts are constantly bathed with an offensive mucopurulent discharge.

Causes.—The disease may be caused by want of cleanliness, pregnancy, or irritating vaginal discharges, and it may also occur as the result of an attack of simple catarrhal or gonorrheal vulvitis.

Subjective Symptoms.—The patient complains of pruritus, irritation, and hyperesthesia of the vulva. The itching is most marked when the disease involves the inner surfaces of the vulva. If the urethra becomes involved, there is burning and pain on urination. The vulvar secretions are increased in amount and may become offensive in odor or irritating to the parts. The extreme sensitiveness of the vulva may cause vaginismus and interfere with sexual intercourse.

Objective Symptoms.—The appearance of the vulva has already been described.

Prognosis.—As a rule, the prognosis is favorable. If the disease is due to vaginal discharges dependent upon malignant disease, little or nothing can be done of a radical nature. The duration of the disease is influenced by treatment. The follicles may spontaneously rupture and dry up, but in the majority of instances the inflammatory condition eventually produces small, hard, nodular indurations. If the disease is allowed to continue unchecked, the urethra is likely to become involved. The discharges are very irritating to the male urethra

and may cause a severe attack of simple urethritis. If follicular vulvitis is due to pregnancy, it usually disappears after labor; in exceptional instances the local irritation causes a miscarriage.

Treatment.—The cause, if possible, must be removed. Absolute rest in bed is not essential, although the patient should keep as quiet as possible to relieve the irritation due to friction in walking. The vagina and vulva should be douched several times daily with normal salt solution to remove the secretions, and hot sitz-baths given to lessen the irritation and pain. A cotton-wool tampon should be introduced into the vagina to collect the discharges and protect the vulva. The bowels should be kept free by the use of a simple laxative or an enema and the occasional administration of a saline. The patient should drink plenty of pure water, and if the urine is over acid liquor potassæ and tincture of belladonna should be given; if it is alkaline, benzoate of sodium or ammonium should be administered. The diet should be simple and easily digested.

Local Medication.—The affected parts should be painted with a solution of nitrate of silver (gr. xx–f℥j) every two or three days and lint compresses soaked in a hot solution of bicarbonate of sodium (gr. xx–f℥j) or potassium (gr. x–f℥j) continuously applied between the labia and over the vulva. If this treatment is not followed by relief in the course of a week, the follicles must be punctured

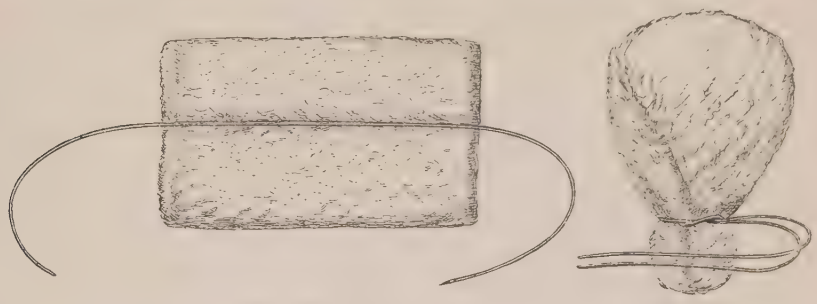


Fig. 185. Fig. 186.

Method of Making a Vaginal Tampon.

Fig. 185, Thread lying across the cotton-wool; Fig. 186, cotton-wool folded and thread tied.

with a slender bistoury and their contents squeezed out. They are then painted with a solution of nitrate of silver (gr. xxx–f℥j) and the following ointment applied:

℞. Ichthyoli, ... f℥j
Acidi carbolici, ... gtt. x
Glycerini, ... f℥j
Unguenti petrolati, q. s. ad. ..... ℥j
M. Sig.—Use locally.

If the inflammation is very severe, lead-water and laudanum should be applied for a day or two before using the ichthyol ointment.

When the disease has nearly run its course, benzoated oxid of zinc ointment should be substituted for the ichthyol preparation, and after all signs of inflammation have disappeared the vulva should be dusted over with talcum, lycopodium, oxid of zinc, subnitrate of bismuth, or calomel powder.

Not more than a dozen follicles should be punctured at one sitting on account of the danger of causing too much irritation. In some cases it may be necessary to cauterize the base of the follicles with lunar caustic. Galvano-puncture has

been used with good results as a substitute for puncturing the follicles with a bistoury and applying nitrate of silver.

In very rare cases the tissues are so altered by the follicular inflammation that it is necessary to dissect off the diseased skin and bring the denuded surfaces together with sutures to effect a cure. (See Excision of the Vulva, p. 963.)

DIABETIC VULVITIS.

Definition.—An inflammation of the vulva caused by the decomposition of diabetic urine from the presence of the *torula saccharomyces.*

Subjective Symptoms.—Intense and constant itching is the most prominent symptom, and there is also local pain and tenderness with increased secretion. The patient complains of burning or smarting during urination, due to the contact of the urine with the irritated and inflamed tissues, and the general health suffers on account of the pruritus, which interferes with rest and sleep.

Objective Symptoms.—The entire vulva has a reddish-copper color and the mucous membrane and skin are parchment-like, corrugated, and dry, with here and there small spaces which are swollen and moist. The parts are more or less excoriated from constant scratching and occasionally small boils develop. As the disease progresses the same changes occur in the skin of the mons veneris, the groins, the inside of the thighs, and over the anal region.

Diagnosis.—The diagnosis is based upon the presence of sugar in the urine and the appearance of the vulva, which is almost pathognomonic.

Prognosis.—The duration of the disease depends upon the course of the diabetes. The local symptoms, however, can be greatly benefited by treatment and the patient made comfortable.

Treatment.—The treatment is divided into (1) the treatment of the diabetes and (2) the treatment of the local lesions.

The Diabetes.—The treatment of the diabetes is based upon general medical principles, and need not, therefore, be discussed here.

The Local Lesions.—The treatment of the local lesions is included under (*a*) cleanliness and (*b*) local medication.

Cleanliness.—The vagina and vulva should be douched several times daily with hot normal salt solution and the parts carefully dried by gentle pressure with a soft towel.

Local Medication.—The vagina should be irrigated once a day with a solution of corrosive sublimate (1 to 2000) or creolin (1 per cent.) and the following ointment applied to the diseased areas:

℞. Acidi salicylici, ... gr. x
Unguenti petrolati, ... ℥j
M. Sig.—Use locally.

Dusting-powders are often beneficial in the treatment of diabetic vulvitis, as they keep the labia apart and protect the skin and mucous membrane from contact with the urine. Equal parts of calomel and subnitrate of bismuth or oxid of zinc are especially useful under these circumstances and may be substituted for the ointment recommended above.

The excoriations and abrasions should be treated by painting them occasionally with a solution of nitrate of silver (gr. xx–f℥j); and then applying benzoated oxid of zinc ointment containing 3 per cent. of carbolic acid, or an ointment of cosmolin containing 20 per cent. of oxid of zinc.

The treatment of the pruritus is considered elsewhere (see p. 184).

INFLAMMATION OF THE VULVOVAGINAL GLANDS.

Causes.—Inflammation of these glands may be due to the following causes:

Gonorrhea.
Traumatism.
Discharges.
Extension of inflammation.
Suppuration of a cyst of the gland.

Gonorrhea.—In nearly all cases the cause is gonorrheal in origin, and the disease starts as a specific vulvitis, which extends to the ducts, and through them eventually to the glands. In some cases the ducts are infected at the same time as the vulva. An abscess of one of the glands often occurs long after all the symptoms of a gonorrheal vulvitis have disappeared and the patient has been discharged as cured. This is due to the fact that the gonococci frequently remain dormant in the ducts for an indefinite length of time, and later on become active again.

Traumatism.—The traumatism may be due to a kick or falling astride of an object, and violent or excessive sexual intercourse has been known to produce inflammation of the gland. An abscess from this cause is most frequently observed in newly married women and in young prostitutes.

Discharges.—Septic discharges from the oviducts, the uterus, the vagina, and the urinary tract may cause infection of the ducts by direct contact. Abscesses of the vulvovaginal glands are met occasionally during the course of a puerperal sepsis.

Extension of Inflammation.—In exceptional instances in the simple catarrhal forms of vulvitis the inflammatory process extends to the ducts, and eventually through them to the glands.

Suppuration of a Cyst of the Gland.—A simple cyst of one of the glands which has remained quiescent for a long time may suddenly take on inflammatory action and suppurate. This may be caused by an acute or latent infection or some form of traumatism.

Frequency.—The disease is very common and only attacks one gland, as a rule, at a time, usually the left. Abscesses of these glands are comparatively rare in the upper classes and very frequent in prostitutes.

Subjective Symptoms.—The patient suffers from the usual symptoms dependent upon an acute inflammation. There is a sensation of heat and burning in the affected part, and the pain, which is constant, is sharp, lancinating, or throbbing in character. There is also more or less pruritus. All the symptoms are aggravated by standing, walking, or sitting, and the patient is comparatively comfortable only in the recumbent posture with the thighs slightly separated. In the majority of cases there is a slight rise in the temperature and a feeling of general discomfort. The affected part is very sensitive and tender and there may be retention of urine.

Objective Symptoms.—In the beginning of the attack the usual signs of an acute inflammation are present and the overlying skin is immovable. The swelling and edema are marked, and as the inflammatory process increases in severity the enlargement of the labium extends to the anus. The mouth of the duct of the gland is inflamed and surrounded by a red areola which resembles a flea-bite—the so-called *gonorrheal macule*. The evidence of the formation of pus is first apparent on the inner side of the labium, and if the abscess is spontaneously evacuated its contents escape by several fistulous openings below the orifice of the duct. The pus, which is discharged in large quantities, has a foul odor and in many instances contains gonococci. The sinuses remain for a long time after all acute symptoms have disappeared and communicate either

with small abscess cavities in the different lobules of the gland, or with a common cavity which results from a general suppuration in the gland structure. In rare instances the sinuses open into the rectum or on the perineum, or they may coalesce and form a large ulcerative surface.

After the acute inflammatory action has subsided the gland remains in a state of hypertrophic induration and a purulent, milky, or greenish fluid is discharged from its duct or the sinuses. This discharge, as a rule, contains gonococci, and frequently infects the male during sexual intercourse; or it may infect the uterus and oviducts by being carried into the vagina by the penis. Again, it may at any time set up an acute gonorrheal vulvitis or be the direct cause of an attack of puerperal sepsis.

The inguinal glands may become involved during an attack of inflammation of the vulvovaginal gland and undergo suppuration.

Prognosis.—The disease yields readily to surgical treatment. If the abscess is not treated, it pursues a chronic course, and the gland and its duct become dangerous foci for the distribution of gonorrheal infection.

Treatment.—If the abscess is seen in the **acute** stage, it should be opened by a free incision on the inner side of the labium; care being taken not to wound the vulvovaginal bulb, which lies just above the upper margin of the gland. The diseased gland is then completely removed by a sharp curet; the cavity flushed with a solution of bichlorid of mercury (1 to 2000), and pure carbolic acid applied. The duct is now opened its entire length and treated in the same manner. The wound is then dried and packed with gauze which is held in position by a compress and T-bandage. If the abscess is seen soon after it has been spontaneously evacuated, the opening should be enlarged and the cavity treated as above.

In **chronic** cases where the gland has undergone hypertrophic induration it should be completely removed by dissection or curetment and the duct and sinuses opened. They are then cureted and pure carbolic acid applied to the wound, which is finally packed with gauze. Immediate closure of the wound with sutures seldom results in primary union, and should therefore not be attempted.

The treatment of inflammation of the gland before suppuration has taken place consists in the application of flaxseed poultices, rest in bed, the administration of salines, and the use of morphin to relieve pain.

INFLAMMATION OF THE DUCTS OF THE VULVOVAGINAL GLANDS.

Causes.—The etiology is the same as in inflammation of the gland itself. The ducts are frequently the seat of latent gonorrhea and often become infected without involving the glands.

Subjective Symptoms.—The symptoms are obscured by the general vulvitis unless there has been a direct infection, in which case the patient complains of localized soreness and pain.

Objective Symptoms.—The opening of the duct is inflamed and surrounded with a red areola, which resembles a flea-bite; the so-called *gonorrheal macule*, which remains for a long time after all acute symptoms of inflammation have subsided and is considered by some authorities as an almost certain evidence of a pre-existing gonorrheal infection. Pressure on the duct causes a drop of pus to appear at its orifice and the presence of gonococci in the secretions determines the specific nature of the inflammation.

Prognosis.—A simple catarrhal inflammation of the duct, which is a very rare condition, generally results favorably. Gonorrheal infection, on the other hand, is a very serious condition, and shows but little tendency toward self-cure.

It is impossible by any plan of treatment to eradicate the disease and at the same time preserve the integrity of the duct and gland. The constant danger of an acute inflammation recurring and the likelihood of infecting the male during sexual intercourse must be borne in mind.

Treatment.—The treatment necessarily destroys the function of the duct and hence the gland should be removed at the same time. After enucleating the gland by dissection the duct is split its entire length and cureted. The wound is then flushed with a solution of corrosive sublimate (1 to 2000); swabbed with carbolic acid; and packed with gauze, which is held in position by a compress and T-bandage.

CYSTS OF THE VULVOVAGINAL GLANDS.

These cysts are either superficially or deeply situated; the former are due to distention of the duct, while the latter are located in the gland. Cysts of the duct are always unilocular, while those of the gland are monolocular when a single lobule is involved or multilocular when more than one is affected.

Causes.—Cysts of the vulvovaginal gland and its duct are due to retention of the glandular secretion, caused by obliteration or constriction of the duct, the result of an inflammation, which is usually gonorrheal in origin. A cyst may also result from a change in the character of the secretions, which may become thick and unable to pass through the duct.

Subjective Symptoms.—A small cyst causes but little or no inconvenience. A large tumor, however, interferes with walking and coitus, and in some cases sexual intercourse is impossible on account of mechanic obstruction and pain. The natural tendency of a cyst of the vulvovaginal gland is to remain quiescent, but the friction to which the parts are subjected in walking often irritates the tumor and causes inflammation which may eventually result in suppuration.

Objective Symptoms.—**Cyst of the Duct.**—The tumor is situated just under the mucous membrane at the base of the nymphæ and projects somewhat into the vagina. The enlargement is globular or ovoidal in shape, seldom larger than a hazelnut, sometimes transparent, and freely movable under the overlying tissues. In some cases the mouth of the duct is patulous and a thick secretion may be forced out by pressure.

Cyst of the Gland.—The tumor is situated in the posterior part of the labium majus, between the vaginal inlet and the ascending ramus of the ischium. It is ovoidal in shape, with a smooth surface, and freely movable under the overlying tissues. As a rule, these cysts do not grow larger than a hen's egg, but cases are occasionally met where they attain much larger proportions. They are seldom transparent and are observed most frequently on the left side of the vulva. The tumor on pressure is elastic, irreducible, without pain unless inflamed, and gives a dull note on percussion. The contents of the cyst may be simply the normal secretion of the gland, which is colorless and like the white of an egg, or its character may be changed to a yellowish or chocolate colored fluid of a thick and viscous consistency.

Prognosis.—If the cyst is emptied by an incision or spontaneous evacuation occurs, it will refill. The tendency to become inflamed and undergo suppuration should be borne in mind.

Treatment.—The gland and its duct should be extirpated and the wound closed with deep and superficial sutures. If the cyst is inflamed or suppurating, the technic of the operation is the same as in cases of abscess of the vulvovaginal gland.

PRURITUS VULVAE.

Definition.—An irritable condition of the terminal sensory nerves, which is characterized by intense itching of the vulva and surrounding parts.

Causes.—The affection is caused by so many different pathologic conditions that no general classification is possible. The following causes have been noted:

Diseases of the vulva.	Habits.
Irritating discharges.	Reflex irritation.
Parasites.	Diathesis.
Congestion.	The menopause and old age.
Traumatism.	Nervous origin.

Diseases of the Vulva.—Diseases of the vulva are often accompanied by pruritus, and the affection is therefore frequently associated with vulvitis, varicose veins, edema, eruptive diseases, vegetations, and trichiasis.

Irritating Discharges.—The oviducts, the uterus, the vagina, the kidneys, the bladder, or the urethra may be the source of a discharge which may irritate the vulva and cause pruritus. An abnormal discharge from the rectum or anus may cause itching of the vulva, and malignant diseases of the genital organs are also particularly liable to produce pruritus. Incontinence of urine and fecal or urinary fistulas are a source of constant irritation, and a severe pruritus often results from fermentation of diabetic urine.

Parasites.—The following parasites may cause pruritus: The ascaris lumbricoides or round-worm; the oxyuris vermicularis or seat-worm; the pediculus pubis or crab-louse; the pulex irritans or common flea; and the acarus scabiei.

Congestion.—Pathologic conditions which result in congestion of the genital organs, especially of the vulva, are frequent causes of pruritus. The most common of these conditions are, misplacements of the uterus, cystocele, rectocele, hemorrhoids, constipation, congestion of the pelvic organs, and diseases causing obstruction of the portal circulation. Some women suffer from pruritus at their monthly periods and others are troubled with itching of the vulva during pregnancy, especially at the beginning and end of gestation, when the congestion is most marked.

Traumatism.—Mechanic irritations of the vulva result in congestion or inflammation, and later on pruritus develops. Thus very fat women suffer from friction of the parts in walking and women who lead a sedentary life are apt to have vulvar irritation follow unaccustomed exercise of a violent character, such as horseback-riding, skating, long walks, etc. The habit of masturbation eventually leads to congestion and pruritus. Excessive venery is also a frequent cause, and is common among young prostitutes.

Habits.—Pruritus is often observed among the lower classes from want of cleanliness, and in some cases a sedentary or indolent mode of life may be responsible for the symptom. High living, indigestible foods, or the use of immoderate quantities of wine or spirits may produce general plethora and cause pruritus.

Reflex Irritation.—In certain cases diseases of the genito-urinary organs and the intestines may provoke reflex irritation of the terminal sensory nerves of the vulva and cause pruritus. Itching of the glans penis in vesical stone is a familiar example of this form of reflex disturbance in the male.

Diathesis.—Pruritus is often due to uric acid, and some women suffer from the affection only during the cold weather, while others are free from itching except during the summer months.

The Menopause and Old Age.—Pruritus vulvæ may develop during the menopause and be accompanied by an itching or burning sensation over other

parts of the body. The symptom, as a rule, gradually disappears with the circulatory and nervous phenomena of the climacteric. The atrophic changes which take place in the mucous membrane of the vulva, the vagina, and the uterus may result in senile inflammations which are associated with excessively irritating discharges that irritate the vulva and cause an intolerable pruritus long after the menopause has been passed. In senile vulvitis the mucous glands of the meatus are involved in the inflammatory process and increase the severity of the local symptoms.

Nervous Origin.—In exceptional cases some authorities have regarded the symptom as purely nervous in origin, and pruritus from this cause may be met in women late in life who have a neurotic temperament. It is very rare, however, in young women and in those having a normal nervous system.

Unsatisfied sexual desires may be a cause of pruritus, and this form of the affection is met in young widows and women whose husbands have been absent for a long time.

Subjective Symptoms.—The itching may be constant or intermittent, and it may occur at night after getting into bed or after exercising, especially in warm weather. The paroxysms are also brought on or aggravated by sexual intercourse or masturbation, and some women suffer only at the menstrual periods or during pregnancy. The attacks may be paroxysmal and there may be intervals of several hours or days between them.

The irritation in the beginning is not marked, as a rule, but gradually becomes so exacting that the patient is compelled to constantly rub and scratch the parts to obtain relief. The scratching, however, while it affords temporary alleviation, only makes the condition worse by increasing the congestion and irritating the skin and nerve-endings. In some cases the patient rubs the parts so violently that excoriations and abrasions occur and the hair is pulled out. In cases of pruritus due to senile vulvitis, or in those occurring from a nervous cause in women with a neurotic temperament, the itching is constant, intense, and intolerable.

The clitoris alone may be the seat of irritation; usually, however, the entire vulva is involved, and the pruritus may spread to the vagina, the inner surface of the thighs, and anal region; in cases occurring during pregnancy the lower abdomen may be affected.

The health of the patient suffers severely in aggravated cases and the loss of sleep and appetite lead to physical exhaustion. Grave nervous symptoms may also develop and the patient may become melancholic or insane. The use of opium still further adds to the drain upon the system and eventually increases the local symptoms. The sexual desires are greatly increased and the patient may suffer from erotic sensations which eventually lead to masturbation.

Objective Symptoms.—The appearance of the vulva depends upon the cause of the pruritus. The rubbing and scratching increase the inflammatory conditions and there is more or less edema of the clitoris, the vestibule, and the nymphæ. The parts are excoriated and eroded and small ulcers may be observed. Later on, there may be permanent thickening or hypertrophy of the tissues, and small cicatrices may be seen which are due to the healing of small ulcers. In cases where the surrounding parts are involved the irritation and inflammation are observed on the inner surface of the thighs, the anal region, and mons veneris.

The condition of the parts in cases in which no local cause exists is more or less characteristic. The skin and mucous membrane have lost their normal elasticity and are bleached or anemic in appearance and small whitish spots are observed which are paler than the surrounding tissues.

Diagnosis.—Pruritus vulvæ is a symptom which is due to a definite cause and the diagnosis is based therefore entirely upon its recognition.

Prognosis.—The prognosis depends upon the cause producing the symptom. Cases due to nervous causes, senile changes, or obscure conditions are always unfavorable, and those occurring during pregnancy or at the time of the menopause usually disappear spontaneously.

Treatment.—The treatment is divided into (1) the treatment of the cause and (2) the treatment of the pruritus.

Treatment of the Cause.—The treatment of the causes of pruritus is discussed under their respective headings.

Treatment of the Pruritus.—The treatment of the pruritus is divided into (*a*) the general; (*b*) the local; (*c*) the use of the *x*-rays; and (*d*) the operative.

General Treatment.—A highly nitrogenous diet must be forbidden. The food should be nourishing and easily digested and the free use of milk is especially recommended when it agrees with the patient. Alcoholic drinks must be avoided. The bowels should be regulated by the daily administration of a simple laxative and the occasional use of a saline. The urine should be made bland and non-irritating by the free use of pure water and over-acidity corrected by the administration of liquor potassæ and tincture of belladonna. If the urine is alkaline benzoate of sodium or ammonium should be given.

The duration and character of the exercise taken by the patient depend upon the cause of the pruritus. While we must be careful not to weaken her by close confinement, yet we should also remember that in many instances the local disease is frequently made worse by friction of the parts in walking. Under these circumstances the patient should take a daily drive in an open carriage and enjoy the benefits of the fresh air and sunshine. A change of environment is especially beneficial when the disease occurs in women with a neurotic temperament, and under these conditions a residence at the seashore and sea-bathing often effect a cure after all other means have failed.

A general tonic course of treatment is indicated in a large proportion of the cases of pruritus, and the administration of mineral acids, quinin, arsenic, and iron is often followed by beneficial results.

Large doses of sodium or potassium bromid often relieve the general nervousness and local irritation, and equally good results are obtained at times by the administration of potassium iodid or tincture of cannabis indica. The use of opium and other habit-forming drugs to promote sleep must be forbidden. The following remedies are recommended as hypnotics: sulphonal, gr. x–xx; paraldehyd, gtt. xx–xxx; or urethan, gr. xv–xx, given at bedtime and repeated in two hours; chloralamid, gr. xv–xl, given one and a half hours before bedtime; trional and tetronal.

Local Treatment.—*Cleanliness.*—The vagina and vulva should be irrigated twice a day and kept free from irritating discharges. The following douches are recommended: Normal salt solution; bichlorid of mercury (1 to 2000); a 2 per cent. solution of creolin, acetate of lead, or carbolic acid; and a saturated solution of boric acid.

The vaginal discharges should be kept within the vagina by a tampon of cotton-wool and not allowed to come in contact with the vulva. The tampon should be saturated with boroglycerid, or one part of acetate of lead to seven of glycerin, or 25 per cent. of ichthyol in glycerin. A dry tampon may be used in some cases, and nothing is better for this purpose than dusting with boric acid or borax. A hot sitz-bath keeps the parts clean and allays irritation.

Applications.—Direct medication to the vulva is made in various ways and is

an important part of the treatment. The following methods and remedies are recommended:

Lint compresses are an excellent means of applying remedial agents. Many cases are greatly benefited by a saturated solution of potassium bromid. Good results are also obtained with bichlorid of mercury, 1 to 2000; a 2 per cent. solution of carbolic acid; a 10 per cent. solution of cocain; or lead-water and laudanum. Cloths wrung out of hot or cold water and applied to the vulva often give temporary relief followed by a night's rest.

Saturating a pledget of absorbent cotton held in the grasp of a pair of dressing forceps with a remedial agent and painting the surface of the vulva is a very efficient method of applying local treatment. The frequency of the application depends upon the character and strength of the remedy. The following preparations have been found of service: A 10 per cent. solution of carbolic acid or cocain; dilute hydrocyanic acid, f℥ij, acetate of lead, gr. xl, and glycerin, f℥j; three grains of morphin to one ounce of water; and one part of dilute hydrocyanic acid to an ounce of glycerin. A cure has been effected in some cases by painting the parts with pure ichthyol once or twice daily. The use of one grain of corrosive sublimate to an ounce of the emulsion of almonds, applied twice a day, has had wonderful results in relieving the condition (Skene); sixteen drops of chloroform to an ounce of the same emulsion is also beneficial. Good results are obtained by the daily application of equal parts of tincture of iodin, aconite, and opium mixed with 8 per cent. of carbolic acid.

Rubbing the parts with a pencil of menthol often gives temporary relief and cauterizing them with a solid stick of nitrate of silver or pure carbolic acid either alone or combined with equal parts of tincture of iodin may be tried with hopes of success when less severe remedies have failed.

A solution of iodoform in ether sprayed over the affected parts with an atomizer leaves a fine deposit which soothes the irritation and gives relief.

The use of healing and soothing powders dusted over the vulva is essential in the treatment of certain cases of pruritus. These powders protect the diseased surfaces from irritating discharges and lessen the friction in walking. The best powders for this purpose are oxid of zinc, subnitrate of bismuth, talcum, lycopodium, and calomel.

Ointments are beneficial in many cases. The following are recommended:

℞. Acidi carbolici, ... f℥ss
Mentholi, ... gr. xx
Unguenti petrolati, ... ℥j.—M.

℞. Chloralis, ... ℥j
Unguenti petrolati, ... ℥j.—M.

Petroleum ointment combined with acetate of lead, chloroform, or camphor is frequently employed with good results. Benzoated oxid of zinc ointment combined with 3 per cent. of carbolic acid is often used to protect and heal the excoriations and abrasions. The following formula makes a good ointment to allay the irritation:

℞. Mentholi, ... gr. v
Unguenti creosoti, ...
Unguenti camphoræ, ...
Unguenti belladonnæ, ...
Unguenti petrolati, ... āā ℥ij.—M.

In obscure cases where no local cause can be discovered, excellent results have followed the use of the galvanic current applied to the affected parts.

The Use of *x*-rays.—The *x*-ray treatment of pruritus is discussed on page 77.

Operative Treatment.—In chronic cases of pruritus vulvæ which do not respond to medical treatment operative interference must be thought of and the question of partial or complete removal of the external organs considered.

In some cases the labia majora, the nymphæ, or the clitoris should be removed, and in others a complete extirpation of the vulva may be necessary to effect a cure (see Excision of the Vulva, p. 963).

KRAUROSIS VULVAE.

Definition.—A progressive atrophy and contraction of the tissues of the vulva.

Pathology.—The disease affects the labia majora, the nymphæ, the vestibule, the hymen, and the vulvar orifice. It begins by the appearance of small brown spots, of irregular shape, on the surface of the vestibule and nymphæ. These spots are slightly depressed below the surface of the affected part, and either spread, or disappear entirely, to recur in another place. During the later stages of the disorder the spots are absent.

As the disease advances the tissues become tense and contracted and shining white in appearance. Later on, when the atrophic changes have become well established, the vulva is shrunken, dry, hard and brittle, and its normal appearance altered. The vulvovaginal orifice also becomes contracted, and in some cases the narrowing is so marked that it is impossible to introduce the finger into the vagina without tearing the tissues. The hair on the vulva becomes dry and gradually falls out. In the advanced stages of the disease the nymphæ and clitoris have almost entirely disappeared and the vulva is scarred and wrinkled.

In some cases the vulva may be bathed with a slight discharge which is brown or yellow in color and extremely irritating.

Cause.—The cause is unknown. The disease may occur at any time after puberty and affects both virgins and married women alike.

Subjective Symptoms.—In some cases the patient suffers little or no inconvenience. In the majority of instances, however, there are severe paroxysms of pain, and a sensation of burning and pruritus in the diseased parts. The vulva is especially sensitive during the early stages of the disease when the small brown spots are present, and the contact of urine during micturition causes severe smarting. In many cases coitus is impossible on account of the extreme contraction of the vulvovaginal orifice and the severe pain occasioned by the attempt to introduce the penis. As a rule, the parts are dry, but in some cases patients complain of a slight discharge which is often very irritating and offensive.

Objective Symptoms.—The appearance of the vulva has already been described.

Diagnosis.—The diagnosis is based on the objective symptoms.

Prognosis.—The progress of the disease is very slow. Labor is usually attended by extensive lacerations of the soft parts due to the contraction and want of elasticity of the tissues. The disease has no tendency toward a spontaneous cure and no relief can be looked for unless radical measures of treatment are instituted.

Treatment.—The treatment is divided into (1) the palliative, and (2) the operative.

Palliative Treatment.—The palliative treatment is directed toward the relief of the pain, the burning, and the pruritus. All local applications are more or less unsatisfactory. The most permanent relief is afforded by the application of pure carbolic acid or the solid stick of nitrate of silver to the diseased tissues.

Cocain is very temporary in its action and in some cases its use increases the severity of the symptoms. A lint compress soaked in a saturated solution of acetate of lead and laid over the parts often gives the patient comfort. Vaselin, combined with 1 per cent. of yellow mercuric oxid and smeared over the parts, is beneficial in some cases, and lint compresses or cloths wrung out of hot water and applied to the vulva are often very soothing.

The cracks and fissures which occur from time to time are treated by touching them with a solution of nitrate of silver (gr. xxx to f℥j) and applying benzoated oxid of zinc ointment. The vulva must be protected from the urine during micturition, and nothing is better for this purpose than vaselin containing 3 per cent. of carbolic acid.

Operative Treatment. — The following operations are recommended: (*a*) Forcible dilatation of the vulvovaginal orifice; (*b*) curetment; (*c*) cauterization; (*d*) excision.

Forcible Dilatation of the Vulvovaginal Orifice.— The operation must be performed under an anesthetic with the patient in the dorsal posture. The dilatation is accomplished by means of Simon's speculums, or the operator's thumbs, which are introduced into the vagina and drawn apart. In a case occurring in my own practice the subjective symptoms were greatly relieved by this operation.

Curetment. — The removal of the diseased skin or mucous membrane with a sharp curet is followed in some cases by good symptomatic results. The operation is indicated only when the disease is limited to a small area, and even then excision is a better operative procedure on account of the raw surfaces which are left after curetment to heal by granulation.

Cauterization.—The diseased tissues may be cauterized with a thermocautery or galvanocautery. The operation has the same indications and limitations as curetment.

Excision.—Complete removal of the diseased surfaces, including the loose connective tissue immediately beneath the skin, which, according to Longyear, is sclerotic, is the operation which promises the best and most permanent results. The technic of this procedure is described on page 963.

TRICHIASIS.

Definition.—When the hairs about an orifice become inverted and grow inward, the condition is known as trichiasis. The disease is rare. The hairs of the labia majora are most frequently affected, although the condition may also occur on the mons veneris and around the anus.

Subjective Symptoms.—There is an intense pruritus and a burning sensation in the affected parts. If the disease is followed by inflammation of the vulva, the subjective symptoms of simple catarrhal vulvitis are also present.

Objective Symptoms.—A careful inspection of the parts reveals the inverted hairs. At the site of each ingrowing hair a small pustule is observed. Excoriations and abrasions may be present from scratching and the surface may be covered with small scabs of dried pus. If the vulva is inflamed, the physical signs of vulvitis are present.

Diagnosis.—The diagnosis is based on the presence of inverted hairs.

Prognosis.—The condition yields readily to treatment.

Treatment.—The papillæ of the inverted hairs should be destroyed by electrolysis. The application of the current to the follicle must be made before the hair is removed, as it serves as a guide for the introduction of the needle into the papilla. The current should be applied for about half a minute; it is then turned off and the hair grasped with fine forceps and gently removed. If

the hair does not come away easily, the current should be applied a second time. Not more than twelve hairs should be removed at one sitting, and in order to prevent inflammatory reaction occurring they should be taken from different parts of the vulva. During the first twelve hours after the operation hot compresses are applied to the vulva and the parts then covered with benzoated oxid of zinc ointment containing 3 per cent. of carbolic acid.

The **routine treatment** of trichiasis consists in the daily use of a vaginal douche of hot normal salt solution and bathing the vulva with a warm solution of bicarbonate of sodium (gr. xx to f℥j) or potassium (gr. x to f℥j) to remove the scabs of dry pus.

ELEPHANTIASIS.

Definition.—Elephantiasis is a chronic hypertrophic disease of the skin and subcutaneous connective tissue, characterized by an increase in size of the affected part, accompanied by inflammation of the vessels and lymphatics, swelling, edema, thickening, induration, more or less pigmentation, fissures, and warty growths (John V. Shoemaker).

Causes.—The disease is endemic in tropical countries, especially in localities where the drinking-water is taken from a subsoil contaminated with decaying vegetable matter and other filth. The prevalence of the disease in the Barbadoes Islands has given the synonym of "*Barbadoes leg*" for the affection when it occurs in that region of the body. Sporadic cases are seen in all parts of the world. The disease usually begins between twenty-five and fifty years of age; it is rare before sixteen, although cases affecting the lower limbs have been reported as early as two years of age.

The affection is probably due to the presence of a thread-like worm and its ova—the *filaria sanguinis hominis*—which organisms are introduced by the bite of the mosquito. According to some authorities, it may be caused by repeated attacks of lymphangitis, traumatism, erysipelas, or any condition causing local obstruction to the circulation.

Subjective Symptoms.—The local symptoms are chiefly due to the mechanic inconveniences resulting from the hypertrophied vulva, which cause a sensation of weight and interfere more or less with walking, sexual intercourse, urination, and defecation. In some cases patients complain of pruritus and smarting, or there may be a discharge and severe pain if the parts become irritated or excoriated.

Amenorrhea and chyluria are frequently observed, especially in the endemic form of the disease.

In tropical countries the disease begins as an acute lymphangitis, with marked local and constitutional symptoms, lasting for about two weeks, and gradually subsides leaving the vulva slightly enlarged and edematous. Subsequent attacks occur, with intervals between them varying from several weeks to as many years, which cause the vulva to become permanently and enormously enlarged.

Objective Symptoms.—The labia majora are most frequently affected, next the clitoris, and lastly the nymphæ. In some cases the entire vulva, the perineum, and the tissues surrounding the anus are involved. When the growth is large, it is more pendulous than pedunculated, although its base is elongated by traction and becomes the narrowest part. Some tumors are so large that they reach to the knees or ankles and weigh forty or fifty pounds. The surface of the tumor is hard and it may be smooth, rough, or warty. Fissures and excoriations are observed, and at times distinct patches of ulceration are seen, which are caused by friction and the urine getting into the depressions on the surface and undergoing decomposition. In some cases the ulcerations

involve the lymphatic vessels and the lymph is discharged upon the surface of the growth, causing an offensive odor.

The inguinal glands are frequently enlarged.

Diagnosis.—The diagnosis is based on the subjective and objective symptoms and the microscopic examination.

Prognosis.—The disease is never cured spontaneously, but pursues a slow chronic course and does not endanger life unless pyemia or thrombosis supervenes. It is, however, amenable to surgical treatment.

Treatment.—The treatment is divided into (1) the medical, (2) the surgical, and (3) the use of the *x*-rays.

Medical Treatment.—Results can be obtained only in the *early stages* of the disease. The acute lymphangitis should be treated on general principles and the patient placed absolutely at rest in bed, the bowels kept open with salines, and cloths wrung out of hot or cold water or saturated with a solution of lead-water and laudanum applied to the vulva. After the acute inflammatory process has disappeared a generous diet should be given and all alcoholic beverages forbidden.

An ointment containing mercury or iodin is applied daily to the vulva and pressure made upon the parts with a compress and T-bandage. Internally the patient should be given iron, arsenic, quinin, or potassium or sodium iodid. Massage and the application of the galvanic and faradic currents combined with electrolysis have proved beneficial in many cases. A change of climate adds largely to the chances of ultimate recovery.

Thomasz, of Ceylon, uses the sulphid of calcium internally combined with the local application of ointments and compression. He claims to cure cases of six months' duration in from one to two months and to benefit greatly others of longer standing. He gives one grain of the remedy twice a day, after eating, for a period of one month. The dose is then increased to one grain and a half and later on to two grains.

Surgical Treatment.—The sporadic cases seen in this country and the chronic forms of the disease met in the tropics are treated by removing the hypertrophied parts with a knife. The technic of the operation depends upon the peculiarities of each case, and no general rules can, therefore, be laid down which will answer all indications. The main objects in the technic are to remove the diseased tissues completely and to bring the edges of the wound together so as to restore as nearly as possible the normal contour of the vulva. The antiseptic precautions must be absolutely perfect, as suppuration is particularly dangerous on account of the dilated condition of the lymphatic vessels.

The Use of the *x*-rays.—The *x*-ray treatment of elephantiasis is fully discussed on page 77.

VARICOSE VEINS.

Definition.—A permanently dilated, elongated, knotty, and tortuous condition of the veins.

Causes.—The causes are: (1) Pregnancy; (2) conditions interfering with the venous circulation of the vulva.

Pregnancy.—The largest number of cases are seen during pregnancy, as the physiologic congestion of the parts at that time is not only a predisposing but an active cause, and when the pregnant uterus is retrodisplaced or gestation is associated with a small pelvic tumor, the pressure upon the return circulation of the pelvis causes the veins of the vulva to enlarge.

Conditions Interfering with the Venous Circulation of the Vulva.—The venous circulation of the vulva is interfered with by pelvic exudates or

adhesions; abdominal or pelvic tumors; uterine displacements; chronic constipation; prolonged standing; heavy lifting; occupation; and straining at stool.

Subjective Symptoms.—When the veins are slightly dilated, they cause little or no inconvenience; but when the tumor is large enough to interfere with the normal contour of the parts, the patient complains of aching, itching, and burning and a sensation of heaviness or weight in the vulva. These symptoms are increased in severity by exercise or coitus, and walking is often followed by more or less suffering.

Objective Symptoms.—The most frequent situation is the labia majora, although other parts of the vulva are often affected, and in some cases the vagina is also involved. Inspection reveals an elongated, irregular, and knotted mass of a dark blue color with the dilated and tortuous veins more or less distinctly shown under the skin. Palpation elicits the characteristic boggy sensation of dilated blood-vessels, which are readily detected by the examining fingers and made to disappear on pressure. The size of a varicose enlargement varies from a slight dilatation of a few of the veins to a mass the size of a cocoanut; the largest tumors are seen during pregnancy.

Results and Prognosis.—Varicose veins occurring during pregnancy increase in size until the end of gestation, when they gradually become smaller, but never entirely resume their normal caliber. When they recur in succeeding pregnancies, the enlargement of the veins becomes permanent. In the non-pregnant state they pursue a chronic course. They may rupture and cause a hematoma or an open hemorrhage, or phlebitis may occur and produce fatal results. Varicose veins are likely to cause edema of the parts, which may be followed by an eczematous eruption, abrasions, or small ulcers.

Treatment.—The treatment is divided into (1) the palliative, and (2) the radical.

Palliative Treatment.—When varicose veins occur during pregnancy, they should be supported by a vulvar compress of lint, which is held in position with a T-bandage. An abdominal binder should be worn to support the uterus and relieve the pressure on the veins in the pelvis. The patient must avoid heavy lifting or straining and the bowels must be kept regular. When the veins are greatly distended or the local symptoms become exacting, rest in the recumbent posture for a few minutes several times daily is indicated, and in some cases it may be necessary for the patient to lie down most of the time during the latter part of gestation. Cloths wrung out of hot or cold water and applied to the vulva frequently relieve the aching and burning sensations which are sometimes very annoying symptoms; lead-water and laudanum are useful for the same purposes. The danger of hemorrhage occurring from the rupture of a vein should be borne in mind and the patient should be instructed in case of accident to use firm pressure on the bleeding point until help arrives. The hemorrhage is then controlled with deep catgut sutures or a firm gauze compress held tightly against the bleeding vessels with a T-bandage.

In the non-pregnant state the necessity for treatment, as a rule, is not imperative. The patient, however, should be cautioned against heavy lifting and instructed to keep her bowels regular. If the tumor becomes large enough to cause local symptoms which are not relieved by a compress and T-bandage, the question of radical measures must be considered.

Radical Treatment.—As the majority of cases of varicose veins of the vulva are situated in the labia majora the technic of the operation is practically the same as that employed for the cure of varicocele in the male.

Operation.—The patient is placed in the dorsal posture and the operator sits directly in front of the vulva. The skin of the labium is made

taut by the assistant grasping the tissues above and below the most prominent portion of the tumor and making traction.

FIG. 187.

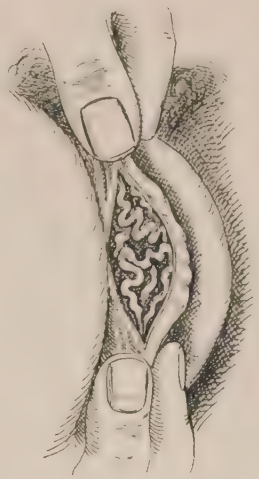


FIG. 188.

OPERATION FOR VARICOSE VEINS OF THE VULVA.

Fig. 187, The skin of the labium being made taut; Fig. 188, the enlarged veins exposed by an incision.

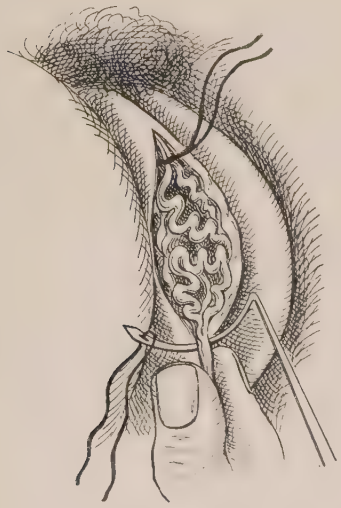


FIG. 189.

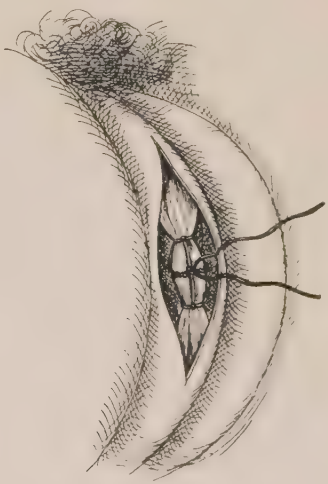


FIG. 190.

OPERATION FOR VARICOSE VEINS OF THE VULVA (page 102).

Fig. 189, The enlarged veins being ligated; Fig. 190, the stumps united by tying the free ends of the distal and proximal ligatures.

An incision an inch long is then made through the skin directly over the varix and the enlarged veins exposed with a dry dissector, without, however, separating them from the surrounding fascia.

The veins are then drawn out of the incision and a ligature of plain cumol catgut carried on an aneurysm needle passed under their distal and proximal ends. These ligatures are now tied and the intervening bunch of dilated veins excised. The stumps are then held in close apposition and the free ends of the distal and proximal ligatures securely tied.

The wound is then closed by three silkworm-gut sutures and the vulva covered with a gauze compress which is held in position with a T-bandage. The sutures are removed on the eighth day.

Varicose veins occurring in other parts of the vulva are exposed by an incision, ligated and removed.

EDEMA.

Definition.—An effusion of serum into the connective tissues of the vulva.

Causes.—Venous Obstruction.—Edema of the vulva may be due to pregnancy or to general anasarca, caused by certain diseases of the abdominal or thoracic viscera, and it may also be associated with varicose veins.

Infection.—This cause is not infrequent, and is met in specific or septic inflammations of the vulva.

Traumatism.—Edema may be caused by direct violence, such as a kick or falling astride of an object, and it may also result from excessive or brutal intercourse or from the traumatism of labor.

Angioneurosis.—Intermittent angioneurotic edema of the vulva is occasionally observed.

Symptoms.—When the edema is due to general anasarca, the entire vulva is enormously swollen, the contour of the parts is lost, and the vitality of the tissues impaired. In some cases the swelling is so great that the patient is unable to bring her thighs together and there is also difficulty in urinating or passing the catheter. The edema resulting from other causes is not so pronounced, the parts do not lose their characteristic shape, and the integrity of the tissues is not destroyed. Traumatic edema is usually limited to one side of the vulva, unless both labia majora are injured.

Intermittent angioneurotic edema or acute circumscribed edema of the skin, as its name signifies, is a recurring disease, and appears suddenly on any part of the body, but more especially on the face or the back of the hands or legs, and cases have also been observed on the vulva. The edema is circumscribed and soft, and pits on pressure; but occasionally it is hard. The surface of the affected part is raised and is either congested or somewhat more pale than the surrounding skin. The swelling varies in dimensions and occasionally attains the size of an orange. The disease often begins for the first time during the night, and the swelling, as a rule, develops and disappears within twenty-four hours, although sometimes it may persist for several days. Relapses are more or less common and the disease may recur at short intervals for an indefinite length of time. The patient complains only of tension in the affected parts, and, as a rule, itching and pain are absent.

Prognosis.—The prognosis is favorable except when the edema is due to general anasarca, and even then it may be greatly benefited by appropriate treatment. *Intermittent angioneurotic edema* is a very obstinate disease and a permanent cure is always doubtful.

Treatment.—When the edema is due to infection, traumatism, or varicose veins, the swelling is not marked and no special treatment is required except that which is directed to the cause. General anasarca calls for the diagnosis and treatment of its cause and the management of the local edema. The woman should be placed at rest in the recumbent posture, and lead-water and laudanum applied frequently to the vulva by means of compresses held in position with a

T-bandage. When the swelling becomes so great that the vitality of the tissues is threatened, multiple incisions should be made through the skin to let out the serum and relieve the tension. After the swelling has subsided sufficiently for the patient to be out of bed, the parts should be kept dusted with a bland powder, such as lycopodium, subnitrate of bismuth, calomel, or boric acid, and the labia separated by a pledget of lint to prevent friction in walking.

In *intermittent angioneurotic edema* the best results are obtained by giving small doses of sodium salicylate internally, regulating the bowels with salines, and administering such tonics as quinin and strychnin. The general condition of the patient should receive attention and disorders of digestion should be corrected.

HYDROCELE OF THE LABIUM MAJUS.

Definition.—A collection of serous fluid in the peritoneal sac which formed the canal of Nuck during fetal life. The disease is very rare.

Pathology.—During fetal life the peritoneal covering of the round ligament extends beyond the internal ring and forms a pouch which is called the canal of Nuck. This canal becomes obliterated after birth, and in the adult the peritoneum stops at the internal ring. When the canal fails to close, it constitutes a patulous tract and becomes the sac of a hydrocele. The fluid contained in the sac is thin and straw-colored, but violence may alter it by causing an extravasation of blood, or inflammation may occur and cause it to become purulent. As a rule, the sac is shut off from the peritoneal cavity by adhesions between its surfaces and the fluid is permanently encysted. Labial hydrocele may occur on both sides of the vulva.

Subjective Symptoms.—The tumor, as a rule, causes little or no inconvenience, unless it attains to large proportions, when it mechanically interferes with walking, sexual intercourse, and labor. The enlargement is slow in developing and starts as an oblong tumor in the inguinal canal and gradually grows downward into the labium majus.

Objective Symptoms.—When seen early, the tumor is situated in the inguinal canal, but later on it descends and appears in the upper part of the labium majus. The swelling is elastic, fluctuating, and translucent, and there is no pain on pressure. It is dull on percussion and when not encysted disappears on pressure or when the patient assumes the recumbent posture; it is increased in size by bearing down or coughing. The enlargement varies in size and may be as small as an almond or as large as a cocoanut.

Diagnosis.—The diagnosis is important because of the danger of mistaking the disease for hernia. The following diagnostic points should be considered in making the distinction between the two conditions: The gradual development of the tumor without any local or general symptoms; the dullness on percussion; the translucency; the elasticity and fluctuation if the tumor is encysted; and the absence of all signs of inflammation.

The differential diagnosis between a strangulated hernia and an inflamed hydrocele is very difficult, but the absence of all symptoms of intestinal obstruction in the latter condition should not be lost sight of.

Prognosis.—The disease pursues a chronic course and there is no tendency toward a spontaneous cure and life is not endangered unless suppuration occurs. The only symptoms likely to be complained of by the patient are those due to the size of the tumor, which may interfere with walking or coitus and obstruct the passage of the child's head during labor.

Treatment.—The treatment is purely *surgical* and consists in the removal of the sac.

Operation.—An incision is made over the entire length of the inguinal canal and the sac exposed. The sac is then dissected out, twisted, and ligated with a silk ligature close to the internal ring. It is then cut off about half an inch from the ligature and the wound closed in the same manner as in the radical operation for an inguinal hernia.

When suppuration occurs in a hydrocele, a free incision should be made and the cavity cureted and thoroughly washed out with a solution of corrosive sublimate (1 to 2000) followed by normal salt solution. The wound is then packed with gauze and allowed to heal by granulation. In cureting away the sac care must be taken not to open the abdominal cavity at the internal ring.

ANTERIOR OR INGUINOLABIAL HERNIA.

Definition.—This form of hernia corresponds to the scrotal variety in the male. It descends through the inguinal canal, following the course of the round ligament, and appears in the anterior part of the labium majus. It may be single or double and the sac may contain the intestine, the omentum, the uterus and its appendages, or even the pregnant womb.

Causes.—In a general way the causes are the same as in the male. The failure of the canal of Nuck to become obliterated at the end of gestation weakens the canal and predisposes to hernia. While not infrequent, the condition is less common than in the male, owing no doubt to the absence of the spermatic cord and to the greater strength of the tissues forming the inguinal canal.

Symptoms.—The patient complains of more or less griping pain or discomfort, especially on exertion, and of gastro-intestinal disturbances which show themselves in the form of dyspepsia or constipation. The hernia appears in the beginning as a small round swelling in the neighborhood of the external ring, and after it has descended into the labium it becomes elongated in shape and constricted at its upper end.

When the hernial sac contains intestine (*enterocele*), the swelling is smooth, regular, and elastic, and its size and tenseness are increased by coughing, standing, lifting, or straining. It disappears or becomes smaller when the patient is lying down and when pressure is made upon it with the fingers. When the hernia is reduced by *taxis*, a gurgling sound is heard as the gut slips back into the abdominal cavity, and the swelling returns again when the patient coughs or assumes the erect posture unless the inguinal canal is temporarily obstructed either by direct pressure or by the finger placed in the ring. Percussion gives a tympanitic note and the characteristic impulse is felt by the examining hand when the patient coughs.

When the sac contains omentum (*epiplocele*), the swelling is irregular in shape and has a doughy or boggy feel. The percussion-note is flat; the tumor is less readily reduced and no gurgling sound is heard as the omentum slips back into the abdominal cavity; and there is but little impulse felt upon coughing.

In an *entero-epiplocele* the character of the contents of the sac is more or less uncertain and the physical signs vary in different parts of the swelling, according as they are occupied by intestine or omentum. Thus, the percussion-note may be dull over one part and tympanitic over another; a portion of the hernia may make a gurgling sound on being reduced, and the rest of the contents of the sac slip back without any characteristic sign; some parts may be smooth, tense, and regular, while others are irregular in shape and doughy or boggy to the touch; and, finally, the impulse on coughing is not so distinct.

The possibility of the uterus or its appendages occupying the hernial sac must be borne in mind. When the sac contains the uterus, the usual physical signs are absent and the tumor is hard, irreducible, irregular in shape, and there is no im-

pulse upon coughing. A pelvic examination reveals the absence of the uterus or the presence only of its lower segment, pulled toward the affected side and fixed, and combined touch establishes the connection between the tumor and the intravaginal portion of the cervix. Should the uterus contain a fetus, the hernia grows rapidly; there is severe local pain; and the usual signs of pregnancy are present. Hernia of the ovary is almost always associated with the same displacement of the oviduct, the intestine, or the omentum, and it is felt as a small almond-shaped mass occupying the inguinal canal or the upper part of the labium, which gives a peculiar sickening sensation on pressure. A pelvic examination reveals a lateral displacement of the fundus of the uterus and combined touch establishes a connection between it and the inguinal tumor. The usual signs of hernia are more or less modified, depending upon the amount of intestine or omentum present and the situation of the ovary.

Differential Diagnosis.—The affection must be distinguished from hydrocele, enlargement of the vulvovaginal gland, and a tumor of the labium majus.

Treatment.—The treatment is divided into (1) the palliative, and (2) the radical.

Palliative Treatment.—This form of treatment consists in the use of a truss, and is indicated in a reducible hernia which can be controlled by mechanic pressure.

The patient should be cautioned against heavy lifting, straining, or any form of violent muscular effort, and the bowels should be kept regular.

Radical Treatment.—The object of a radical operation is to obliterate the inguinal canal and prevent the subsequent descent of the viscera. The radical cure is indicated when the hernia is irreducible or strangulated and when it cannot be controlled by a truss. An operation should not be recommended if a woman is over fifty years or the hernia is small and easily controlled unless she objects to wearing a truss.

Operation.—The technic of the operation is the same as in the male, except that the absence of the spermatic cord changes the anatomic conditions somewhat and renders it unnecessary to construct a new inguinal canal.

BENIGN TUMORS.

While benign tumors of the vulva are comparatively rare they occur, however, sufficiently often to make it necessary to refer to them and discuss briefly their symptomatology and treatment from a gynecologic standpoint.

Symptoms.—The physical characteristics of benign tumors of the vulva are the same as when the neoplasms occupy other portions of the body and their development and growth are in no way interfered with by their situation, except that it exposes them to injury or to irritating discharges from the vagina, the bladder, and the rectum, unless the patient is very cleanly in her habits. Inflammation, therefore, frequently occurs in large tumors, and in some cases the skin becomes deeply ulcerated, causing severe and even fatal hemorrhage. Various forms of degeneration also occur, and in this respect vulvar tumors do not differ from neoplasms situated elsewhere. The symptoms caused by vulvar tumors are chiefly due to the mechanic interference which their presence has upon the functions of the parts. Thus, their size and situation may interfere by traction or pressure with locomotion and sexual intercourse, and in some cases they obstruct the bladder or rectum or direct the flow of urine along an abnormal channel.

Treatment.—Tumors of the vulva should be extirpated and the wound closed with interrupted sutures of catgut or silkworm-gut.

Fibroma; Myoma; Myxoma; Mixed Growths.—These tumors are not common and they generally grow from the labia majora, but they have also been observed in the nymphæ, perineum, and vestibule. They usually increase temporarily in size during menstruation and pregnancy, and they may suddenly become enlarged from the formation of a hematoma caused by direct violence.

These tumors are either pedunculated and grow from a slender stalk, or they are sessile and attached by a broad base.

Fibroids of the vulva occur at any age, but, as a rule, they do not develop before puberty, and they may attain to the size of a child's head or even larger, reaching in some cases down to the knees. Myxomatous tumors do not grow to a large size.

Lipoma.—These tumors are rare. They grow from the fatty tissue of the mons veneris, labia majora, or nymphæ, and occasionally become very large. They may undergo a rapid increase in size during pregnancy, and if the surface of a tumor becomes ulcerated from any cause a severe or even fatal hemorrhage may result.

Neuroma.—These tumors are very rare and are apt to cause vaginismus. Simpson reported a case where a neuroma was situated near the meatus urinarius and was felt as a small tender nodule.

Angioma.—A vascular or erectile tumor is very rarely met with on the vulva. It has but little clinical importance and usually causes no inconvenience to the patient.

CYSTS.

Vulvar cysts are comparatively rare and result from occlusion of sebaceous glands, dilated lymph-vessels, dermoid growths, serous collections in the sac of an old hernia, or a patulous condition of Gärtner's canal.

Sebaceous cysts, which are the most common variety, are superficial and occur usually on the lower part of the labia majora as well as on the vestibule above the meatus urinarius. They contain either a greenish-yellow fluid or a pultaceous mass, and their size varies from a small bean to a hen's egg.

The other varieties of cyst are deep-seated.

Blood tumors, hydroceles, and cysts of the vulvovaginal glands are not included under this heading and are discussed elsewhere.

Symptoms.—Vulvar cysts, as a rule, cause little or no inconvenience, unless they become inflamed and suppurate. When the cyst is the size of a hen's egg, it may interfere with locomotion and cause painful or difficult coitus.

Treatment.—The sac should be extirpated and the wound closed with deep interrupted sutures of catgut or silkworm-gut. If the entire cyst cannot be removed, the remaining portion of the sac should be destroyed by curetment or the actual cautery and the wound packed with gauze and allowed to heal by granulation.

CANCER.

Primary cancer of the vulva is very rare. Epithelioma (*squamous-* or *cylindric-celled*) is the most frequent variety observed, and encephaloid or scirrhous cancer is very seldom met.

Situation.—The disease usually starts from the depression between the labium majus and the nympha. It may, however, develop from the prepuce of the clitoris, the orifice of the urethra, the nymphæ, or the perineum, and in very rare instances from the vulvovaginal glands.

Causes.—The majority of cases occur between forty and sixty years of age, and exceptionally the disease has been observed in very old women and young children. Psoriasis, traumatisms, chronic inflammations, and irritable warts

may be mentioned among the predisposing causes of *primary* cancer, and the disease may also occur as a *secondary growth* from other parts of the body.

Symptoms.—Pruritus vulvæ is an early and more or less constant premonitory symptom of vulvar cancer, especially when the clitoris is the seat of the affection. The itching usually occurs in paroxysms of greater or less intensity and continues off and on throughout the course of the disease. The affection begins as a small, hard, elevated nodule situated in the skin or mucous membrane and covered by several layers of thickened epithelium. Later on the nodule ulcerates and secretes a thin watery discharge having a foul or fetid odor. The secretions eventually lose their serous character and become purulent, very offensive, and mixed with broken-down tissue. The ulceration begins early, as a rule, and spreads rapidly, involving the surrounding parts and inoculating the opposite side by direct contact with the healthy tissues. The disease is not likely to extend into the vagina unless it begins in the vestibule.

The margins and base of the ulceration are irregular in shape and indurated and bathed in a seropurulent discharge. The infiltration extends into the surrounding parts as the ulceration spreads, and when the vaginal walls are involved the urethra feels like a hard tube to the examining finger. Pain is usually a late symptom, and may exceptionally be absent altogether in some cases. Hemorrhages are not common, and when they occur the bleeding, as a rule, is not serious. The lymphatic glands of the groin become infected and swollen.

When the disease develops on a wart, it starts as a sluggish, irritable ulcer which gradually spreads and eventually acquires the usual characteristics of malignant ulceration.

Diagnosis.—The disease must be distinguished in its early stages from lupus vulgaris, chancre, chancroids, ordinary warts (*verruca vulgaris*), condylomata (*verruca acuminata*), and urethral caruncle.

Lupus.—The history of the case is important. Lupus usually begins in early life; it develops very slowly; the general health is not, as a rule, affected; and pain is usually absent or very slight. Cancer, on the other hand, occurs most often between forty and sixty years of age, it develops more rapidly, the general health is affected, and pain is a more or less constant symptom.

The *objective symptoms* present certain features which should be carefully studied. The nodules in lupus are multiple and soft. The ulceration is superficial and covered with "bright red granulation tissue"; it is not circumscribed, but extends in various directions with healthy skin between the lesions; and induration is absent. Again, ulceration and hyperplasia exist side by side and cicatrices are observed at different points, indicating a tendency toward repair which is characteristic of the disease. Furthermore, the lymphatic glands are not involved, as a rule, and the discharge from the ulceration is profuse, odorless, and puriform in character. In cancer there is usually but one nodule, which is hard and infiltrated. The ulceration is deep and circumscribed with indurated and undermined edges and the base of the ulcer is covered with fungoid granulations and broken-down tissues which are bathed with a scanty, viscid, malodorous secretion. The ulcerative process is characterized by continuous destruction of the surrounding tissues without any tendency toward cicatrization and the lymphatic glands are involved early in the course of the disease.

It must not be forgotten that cancer and lupus may attack the vulva at the same time and obscure the diagnosis.

Chancre.—The appearance of a chancre in its early stages resembles cancer very closely. In the former disease there is usually a history of infection followed by a well-defined period of incubation; the ulcer is not painful and shows no tendency to spread; the discharge is thin, sanious, and scanty; the lymphatic

glands are involved very early; and constitutional symptoms are developed, as a rule, within a certain time.

Chancroids.—There is usually a history of infection followed by a period of incubation. The lesion is rapid in development, usually multiple, and seldom involves more than one of the lymphatic glands at a time. The ulcers are highly inflamed; they have abrupt, "punched-out," undermined margins; they are painful to the touch; and their base, which is not indurated, is at first smooth, but soon becomes granulated and secretes a profuse purulent and auto-inoculable discharge.

Warts.—An irritated and inflamed wart can hardly be distinguished from cancer, and as the tendency of all wart-like growths is to become malignant, no time should be lost in removing it for a microscopic examination.

Condylomata.—Venereal warts may be mistaken for the papillary form of cancer, and in case there is any doubt of the diagnosis they should be removed at once and examined by the microscope. The history of the case, the duration of the disease, and the absence or presence of pain and ulceration are important aids in the diagnosis.

Urethral Caruncle.—A mistake in the diagnosis could hardly be made unless the caruncle becomes ulcerated, and under these circumstances its immediate removal, followed by a microscopic examination, is indicated.

Prognosis; Course.—Death usually occurs in from two to three years after the first appearance of the local lesion. Pruritus may exist for a long time before the nodule develops. After ulceration once begins, it spreads rapidly, and death is due, as a rule, to marasmus, produced by chronic septic absorption, loss of rest, and mental depression. Metastatic involvement may also occur and hasten the end.

Treatment.—The treatment is divided into (1) the radical; (2) the use of the *x*-rays; and (3) the palliative.

Radical Treatment.—The only hope of a cure depends upon the early recognition of the disease and the removal of the cancerous structures.

All forms of papillary or nodular growths occurring on the vulva after forty years of age, or even before, should be looked upon with suspicion and their complete excision recommended at once.

The looseness of the vulvar tissues prevents traction on the sutures even when there is an extensive removal of the structures, and consequently there need be no hesitancy in making the incision large enough to eradicate the disease completely.

If the cancerous infiltration surrounds the urethra, it should be held out of the way with a sound while the diseased tissues are excised; and if the lower portion of the urethral canal is also involved, it should be removed close up to the neck of the bladder, leaving only enough of the canal to control the urine.

The technic of the operation of excision of the vulva is described on page 963.

The Use of the *x*-rays.—The *x*-ray treatment of cancer of the vulva is fully described on page 76.

Palliative Treatment.—This form of treatment should be adopted when the disease is well advanced and a radical operation is out of the question.

The ulcerated surfaces are first cureted and then thoroughly cauterized with the thermocautery. The wound is then douched with a solution of corrosive sublimate (1 to 2000) and dressed with gauze which is held in position by a compress and T-bandage.

As the ulcerative process spreads, the indications are to control the fetid discharges, protect the surrounding parts from irritation, and relieve the pain. Lysol, 1 per cent., carbolic acid, 3 to 5 per cent., creolin, f℥ij to the quart, corrosive sublimate, 1 to 2000, and permanganate of potassium, 1 to 3000, are useful in

the form of lotions to lessen the quantity and offensive character of the discharge. Petroleum (refined oil) is likewise very beneficial and may be applied upon a lint compress. Spraying the parts with hydrogen peroxid before applying the lotion is very useful in keeping them clean and correcting the odor of the discharges. The occasional use of the curet and scissors to remove pieces of broken-down tissue will often serve a useful purpose and lessen the discharge. The ulcerative process is frequently held in check or modified by the use of methylene-blue or -violet, and the dry powder of either preparation may be dusted over the ulcerated surfaces or a 1 per cent. solution may be applied as a lotion.

The surrounding parts must be kept clean with soap and water and protected with carbolated vaselin (3 per cent.). An absorbent pad should be constantly worn over the vulva to absorb the discharges and protect the adjacent skin surfaces from contamination. Pain should be controlled with opium and the dose gradually increased as the disease progresses.

SARCOMA.

Primary sarcoma is the rarest form of malignant disease attacking the vulva. It may occur as a round-, spindle-, or mixed-celled sarcoma or as a melanotic tumor; the latter variety is the most frequent. Mixed tumors, such as fibro sarcoma and myxosarcoma, have also been observed and operated upon.

Causes.—The disease is more common in young than in old women, and it may also occur at any period of life either as a *primary* or a *secondary* lesion.

Symptoms.—The objective symptoms depend upon the variety of the disease. In melanotic sarcomata the lesions are multiple and very painful. They start in the skin of the vulva or from a pigmented mole, wart, or nevus, and appear as hard round nodules which are brown or black in color. The nodules rapidly extend and tend to coalesce, but do not, as a rule, grow to a large size, and eventually they become ulcerated. The sarcomatous materials are disseminated by the blood-vessels and the lymphatic glands may become involved through these channels.

In other varieties of sarcoma the lesions are generally single and not painful unless the tumor becomes ulcerated. They begin in the skin or on a mole, nevus, or an old cicatrix, and appear as small, hard nodules of a reddish-pink color. The tumor grows rapidly and may become very large, and is attached to the vulva by a pedicle or a broad base. The lymphatic glands are rarely affected. Winckel has reported three cases of sarcoma which are instructive on account of their large size and long duration. The first case was a round-celled sarcoma the size of a man's head, which grew from the left labium by a pedicle the thickness of a child's arm, and had existed for eight years. The second case was a myxosarcoma situated near the orifice of the urethra which had lasted for fifteen years and was the size of a child's head. The third case was a fibrosarcoma the size of a fist, growing from the right labium majus.

As a rule, vulvar sarcomata show but little tendency to ulcerate unless the skin is broken by friction or some other cause, when a painful excoriation results, and is rapidly followed by the formation of a bleeding, suppurating, necrotic, fungoid mass. Their growth is usually rapid, but occasionally they may develop slowly, or, again, their progressive increase in size may be temporarily checked by periods of quiescence, and the activity of the tumor seems to lie dormant. Hemorrhages frequently take place into the substance of the tumor on account of the thinness of the walls of the blood-vessels and channels which ramify among the cells, and severe or even fatal external hemorrhages may occur when the surface of the growth becomes ulcerated. Rapidly growing tumors are vascular

and those which develop slowly are poorly supplied with blood-vessels. A sarcoma may undergo fatty or myxomatous degeneration, or blood-cysts may form in the substance of the tumor, and finally a large portion of the growth may become necrotic.

Secondary growths, which are generally of the same structure as the primary lesion from which they originate, may occur in any part of the body, but more especially in the pelvic organs, the peritoneum, lungs, and liver. The sarcomatous elements are almost always disseminated by the blood-vessels and the disease often recurs locally after its removal, which is explained by the fact that the surrounding tissues were infiltrated at the time of operation. The constitutional symptoms are the same as when the disease affects other portions of the body, and the size and situation of the tumor may interfere with locomotion or with the functions of the genito-urinary organs.

Diagnosis.—The diagnosis is readily made by a careful study of the physical characteristics of the tumor, the history of the case, and the microscopic findings. A very small ulcerating sarcoma must be distinguished from lupus, syphilis, and cancer.

Prognosis.—Death from sarcoma usually occurs within two years, and only a very small number of cases are recorded of a radical cure following the removal of a sarcomatous growth of the vulva. The disease, as a rule, recurs locally or death results in a few months from metastasis. The melanotic variety is the most malignant of the sarcomata, and in some of the other varieties, as shown by cases already referred to, the tumor may exist for years without causing death or secondary deposits.

Treatment.—The treatment is the same as already described in cancer of the vulva on page 198.

VENEREAL ULCERS.

Under this heading will be considered chancroids, chancre, and the syphilides, which will be discussed only from a purely gynecologic standpoint by pointing out the modifying influences exerted upon these lesions when they occur upon the female genitalia.

CHANCROIDS.

Situation.—While any part of the vulva may be the seat of *primary* chancroids, the affection is most frequently situated on the fourchette, labia majora, nymphæ, vestibule, and the vulvovaginal orifice. It is very rare for chancroids to occur on the wall of the vagina. They have been observed, however, with comparative frequency on the cervix, and also on the perineum, the thighs, the anus, the lower abdomen, and in the urethra. *Secondary* inoculation from the original sores is much more common in females than in males, on account of the two sides of the vulva being in close contact with each other and the difficulty in keeping the parts clean. Multiple chancroids are therefore the rule when the disease attacks the vulva.

Frequency.—Chancroids are observed more often among the lower than the higher class of prostitutes, for the reasons that the former are indifferent as to whom they cohabit with, and they also neglect to examine the male organ before permitting sexual intercourse to take place. The higher class of prostitutes, on the other hand, detect at once any open sore upon the penis and thus save themselves from infection.

Course and Duration.—The course and duration are affected more or less by the situation of the vulva and the anatomic relations of its different parts, and the prognosis is, therefore, in a general way less favorable in women than in

men. Thus, the external organs are constantly exposed to contact with leukorrheal discharges, menstrual blood, and urine, and to friction in walking, and it is therefore often difficult to keep the sores clean or free from mechanic irritation. Again, *secondary* infections are very common in women, and new chancroids may develop indefinitely unless careful attention is given to cleanliness and the separation of the apposing surfaces. And, finally, sores which are almost healed may start to ulcerate actively again as the result of local irritation, and phagedenic ulcers, although rare, are met from time to time in women who are debilitated from alcoholic excess or chronic diseases.

Diagnosis.—The diagnosis may at times be difficult and the disease mistaken for chancre, herpes, eczema, and cancer.

Chancroids generally appear within five or six days after sexual intercourse, and never later than twelve days. They are rapid in development, usually multiple, and seldom involve more than one lymphatic gland at a time. The infected gland becomes intensely inflamed and tends to undergo suppuration.

The ulcers are highly inflamed and painful to the touch. They have abrupt, "punched-out," undermined edges, and thin, non-indurated bases, which are at first smooth, but soon become granular and discharge a profuse purulent auto-inoculable secretion.

Treatment.—The sores should be cauterized at once to convert them into non-specific ulcers and thus prevent auto-inoculation. They should first be anesthetized by a solution of cocain and then cauterized by the thermocautery or sulphuric acid. The vagina and vulva are then thoroughly douched with a solution of corrosive sublimate (1 to 2000), followed by normal salt solution, and after drying the parts with absorbent cotton a vaginal tampon is introduced to retain the secretions. The chancroids are then dusted with iodoform, unless its odor is objectionable, in which case aristol, calomel, europhen, or subiodid of bismuth may be substituted and the labia separated by a piece of lint which is held in position by a compress and a T-bandage.

The ulcers should be sprayed with hydrogen peroxid and fresh dressings applied twice a day.

As soon as healthy granulations begin to form, the dusting-powder should be discontinued and a stimulating ointment substituted. Benzoated oxid of zinc ointment containing 3 per cent. of carbolic acid is a good preparation for this purpose. Da Costa recommends one part of the ointment of mercuric nitrate to seven parts of vaselin. If the granulations become unhealthy or excessive, they should be cleaned with hydrogen peroxid and painted with a solution of nitrate of silver (gr. xx to f℥j) or touched with the solid stick.

Phagedenic ulcers must be cauterized with the actual cautery or nitric acid, and the parts douched and dressed as in cases of ordinary chancroids. In some instances it may be advisable to apply a lotion of corrosive sublimate (1 to 2000) continuously to the ulcer for two or three days. The patient's general condition must be sustained and improved by nourishing food, alcoholic stimulants, careful attention to hygienic rules, and the administration of tonics, especially tincture of the chlorid of iron and quinin.

The development of a bubo demands rest in bed, painting the inflamed gland with iodin, and applying a small compress and spica bandage. In some cases this treatment will cause the inflammation to end in resolution, but if suppuration occurs, a free incision must be made at once and the infected gland cureted away. The infiltrated skin along the edges of the incision is then removed with scissors and the wound flushed with a solution of corrosive sublimate (1 to 1000). The abscess cavity is then packed with gauze and the parts protected by a compress which is held in position by a spica bandage.

CHANCRE.

The initial lesion of syphilis may occur on the female genitalia and the characteristic induration is more frequently absent in women than in men, especially when the lesion is situated on the nymphæ or fourchette.

Situation.—Chancres are less frequently found on the genital organs of women than in other parts of the body, and the reverse of this is true in men, as nearly all of the initial lesions occur upon the penis. The most common situation of a vulvar chancre is on the labia majora, and the next most frequent locations are the fourchette, the nymphæ, the clitoris, the mons veneris, and the groin, in the order in which they are mentioned. Chancres have also been occasionally observed on the cervix, but their occurrence on the vagina is extremely rare, and is denied by most authorities, owing to the absence of glands and the thickness of the pavement epithelium covering the vaginal mucous membrane preventing inoculation.

Course and Duration.—As in chancroids, the course and duration of the lesion are more or less affected by the surroundings, and the ulceration, as a rule, is superficial. Gangrene and phagedena seldom occur.

Diagnosis.—Owing to the conformation and relations existing between the various parts of the vulva it is very easy to overlook the presence of a chancre, and unless the examination is most carefully made an error in diagnosis will result. Again, the frequent absence in the female of induration around the base of the sore makes an early diagnosis very difficult, and the surgeon should therefore be cautious in expressing a positive opinion until secondary lesions appear. The disease may be mistaken for chancroids, herpes, and cancer.

Treatment.—The treatment of a chancre and its complications, phagedena and buboes, is based upon the principles referred to in the section on chancroids, with the exception, however, that the sore should not be cauterized unless it becomes phagedenic.

SYPHILIDES.

The vulva may be the seat of any of the syphilides. Mucous patches, however, are the most frequent vulvar manifestation of secondary syphilis, and they are usually situated on those parts which are in close contact and subjected to the irritating influences of heat and moisture. The lesions may undergo superficial ulceration and their secretions become profuse, purulent, and offensive, or the constant irritation may cause them to hypertrophy and develop into venereal warts or condylomata. Mucous patches are very rare on the vaginal wall and on the cervix uteri.

The most common vulvar manifestation of tertiary syphilis is the gumma, which usually develops in the labium majus as a round tumor and tends to break down and ulcerate.

Treatment.—The parts should be kept clean and the labia separated. The vagina and vulva should be douched twice or thrice daily with a solution of corrosive sublimate (1 to 2000), followed by normal salt solution, and a piece of absorbent lint placed between the labia to prevent friction and absorb the moisture. A vaginal tampon is also indicated when the patient suffers with a leukorrheal discharge. Ointments should not be used because they increase the moisture of the parts and prevent healing of the lesions. Sedative and stimulating dusting-powders, on the other hand, serve the double purpose of medication and absorption and are therefore beneficial in these cases.

Mucous patches should be painted daily with a solution of nitrate of silver (gr. xxx to f℥j), and dusted with iodoform or one of the dusting-powders recommended in the treatment of chancroids. It may be necessary, where there is a

tendency to ulceration or hypertrophy, to spray the patches with hydrogen peroxid and touch them with the solid stick of nitrate of silver once or twice a week.

The treatment of venereal warts is discussed under condylomata on page 204.

The local treatment of a suppurating gumma is based upon the principles laid down in the management of gangrene of the vulva on page 172.

VERRUCAE.

The *verruca* or *wart* is the most frequent new-growth appearing on the vulva, and it is met either as (1) the verruca vulgaris, or (2) the verruca acuminata.

Verruca Vulgaris.—This variety is the ordinary wart, which seldom attains to a larger size than from a pin's head to a small bean, and usually appears in groups, although it is not uncommon for it to be isolated. It may or may not be pedunculated; usually, however, it is attached by a broad or sessile base, and its color is generally the same as that of the surrounding skin or mucous membrane, unless it becomes inflamed. In some cases it is soft in consistency; in others it is hard or even horny; and, as a rule, it is not sensitive unless it becomes irritated. The usual situation for these warts to appear is on the labia majora, the nymphæ, and the mons veneris, and it is not uncommon also to find them on any part of the vulva or around the anus.

Verruca Acuminata.—This variety is spoken of as vegetations, venereal warts, condylomata, moist warts, fig-warts, and cauliflower excrescences. They grow very rapidly and attain to the size of a fist or even larger. The warts are single or multiple, pedunculated or sessile, and in some cases they form large masses of excrescences resembling cauliflowers, cockscombs, bunches of grapes, or mulberries. Their color depends upon the vascularity of the growth and the condition of the epidermis. If the epidermis is present and the surface is dry, their color is the same as that of the surrounding skin or mucous membrane; but if the warts are more vascular than normal and the epidermis is removed by friction or maceration, they are of a deep red or purple hue, and the secretions are purulent, offensive, and highly irritating. Condylomata are situated on any part of the vulva, around the anus, on the inner surface of the thighs, and also on the vaginal wall.

Causes.—The *ordinary wart* is usually caused by want of cleanliness, friction, or pressure, and in some cases it has been attributed to an impaired state of the system.

Venereal warts are due to irritating discharges, gonorrhea, want of cleanliness, and the congestion and leukorrhea of pregnancy.

Symptoms.—*Ordinary warts* cause no subjective symptoms unless they become irritated and inflamed.

Venereal warts are attended with an irritating and foul discharge. They may also become irritated or inflamed and cause pain or tenderness in the parts. Large growths interfere with walking and sexual intercourse, and in rare cases with urination. They also produce a sensation of dragging or weight in the vulva and marked local discomfort.

Diagnosis.—*Verruca vulgaris* is a characteristic lesion and cannot readily be mistaken for any other condition.

Condylomata, on the other hand, are sometimes more difficult to diagnose and may be mistaken for mucous patches. The latter affection is associated, as a rule, with other manifestations of syphilis; it develops slowly: the lesions are fewer in number; the surrounding tissues are not indurated; and the papules are

flat, vary in size, and are either depressed or raised above the surface of the parts.

Results and Prognosis.—*Ordinary warts* are of no special importance, causing but little or no inconvenience and yielding readily to treatment.

Venereal warts are a more or less serious condition and call for prompt and energetic measures. When they develop during pregnancy they may atrophy and finally disappear after labor. In old women they may undergo malignant degeneration or become gangrenous and cause death. The discharge from warts is very irritating and is apt to infect other parts of the body. Thus, it may cause purulent ophthalmia, vulvitis, vaginitis, urethritis, or puerperal sepsis; and, again, it may infect the eyes of the child during labor, or the urethra of the male at the time of sexual intercourse. Condylomata are liable to return unless they are carefully removed and all the diseased tissues destroyed. They may grow to a very large size and obstruct the urethral or vaginal canal.

Treatment.—The treatment is divided into (1) the general, and (2) the local.

General Treatment.—As some cases of verruca are dependent upon or associated with an impaired condition of the general system, it is important in the treatment of these patients, especially in strumous or anemic children, to consider the question of internal medication and to administer those remedies which have a tonic effect upon nutrition and hematosis. The following drugs are recommended: Arsenic, the mineral acids, cod-liver oil, bitter tonics, and iron.

The following remedies are considered to be more or less specific in their action upon warts: Tincture of thuja, in 5-minim doses, t. i. d.; tincture of iodin, in 10-drop doses twice a day; and carbonate and sulphate of magnesia, in 5-grain doses each before meals twice daily.

Local Treatment.—The *ordinary wart* (V. vulgaris) is removed by excision or local applications; the former method is preferable. The wart is grasped with tissue forceps and cut out with curved scissors and the wound cauterized or brought together with a catgut suture.

Nitric acid is the best local application for removing these warts, and should be applied by means of a glass pen—the kind used in marking with indelible ink—directly to the surface of the growth after first smearing the surrounding tissues with vaselin. Deep cauterization should be avoided and several light applications of the acid made instead of using a large quantity at one time. The following local applications also give good results: salicylic acid and flexible collodion (℥j to f℥j); bichlorid of mercury (gr. xx to f℥j) and lactic or acetic acid.

Venereal warts (V. acuminata) should be excised with curved scissors and the raw surfaces cauterized with the thermocautery or the wound closed with interrupted catgut sutures. As a rule, a general anesthetic is required, but in some cases the operation may be performed under the influence of a solution of cocain applied hypodermically.

Condylomata developing during pregnancy should be removed before labor in order to guard against the possible occurrence of sepsis and the danger of infecting the child's eyes.

If for any reason the removal of venereal vegetations is contraindicated, they may be made to disappear and sometimes permanently cured by applying equal parts of calomel and salicylic acid or oxid of zinc and subnitrate of bismuth. The parts should be kept clean by vaginal douches of corrosive sublimate (1 to 2000), followed by hot normal salt solution and the daily use of a hot sitz-bath. In case the vulva becomes irritated and walking causes pain, the labia should be separated with a piece of absorbent lint and the parts protected by a compress held in position with a T-bandage.

ADHESIONS OF THE CLITORIS.

Causes.—The relations existing between the superior folds of the nymphæ and the rounded extremity of the clitoris often lead to adhesions between the glans and its prepuce as the result of irritating discharges, inflammation, and uncleanliness. Adhesions are quite common in new-born children. They are very rare in the negro race, and according to Morris 80 per cent. of the Aryan American women suffer more or less from a false union of the glans.

Symptoms.—The local and reflex disturbances depend upon the extent of the adhesions, and are most pronounced when the entire glans is bound down by its prepuce. In some cases sebaceous matter accumulates under the hood of the clitoris and causes an irritation which results in local tenderness and pain. Again, adhesions may produce serious reflex symptoms; they may lead to the habit of masturbation; and they may also be the exciting cause of morbid sexual desires.

According to some authorities, adhesions are a common cause of ill health in young women and an important factor in the causation of various neuroses. Reflex symptoms, as a rule, are more pronounced during childhood than later on in life, and they are also usually of a more serious character.

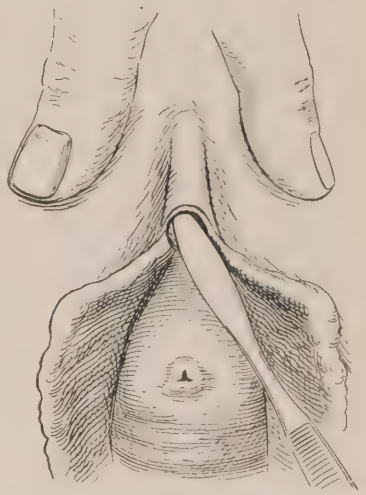


FIG. 191.—OPERATION FOR ADHESIONS OF THE CLITORIS.

Shows the adhesions being broken up with a dry dissector.

Diagnosis.—A physical examination reveals the presence of the adhesions. Some authorities advise that all female children should be examined when they are two or three months old and the clitoris liberated if found to be adherent. While this may or may not be good practice, there can be no doubt of the necessity for such an examination whenever local irritation or reflex symptoms manifest themselves. A neglect of this precaution will often lead to an error in diagnosis and want of success in treatment.

Prognosis.—Adhesions of the clitoris are readily cured by proper treatment. Adhesions retard the development of the clitoris, and unless they are broken up the organ is apt to be undersized.

Treatment.—The treatment consists in the separation of the adhesions as follows: The patient is placed in the dorsal position and a 10 per cent. solution of cocain applied on a pledget of cotton to the clitoris and upper portion of the nymphæ. The clitoris is then grasped between the thumb and index-finger of the left hand and the prepuce pulled back as far as it will retract, while at the same time the glans is completely exposed by breaking up the adhesions with a dry dissector. The parts are then cleaned with a warm solution of corrosive sublimate (1 to 2000) and carbolated vaselin applied to the raw surfaces before allowing the prepuce to slide back over the glans. To guard against the reformation of the adhesions the glans is exposed and vaselin applied every day until the parts return to their normal state.

HYPERTROPHY OF THE CLITORIS.

Causes.—Prior to puberty the clitoris is relatively large, owing to the undeveloped condition of the labia, and later on as the vulva increases in size it becomes less prominent. True hypertrophy is comparatively rare in our climate and is met, as a rule, in tropical countries. In hot climates the heat decomposes the secretions of the parts, and if a woman is uncleanly in her habits the resulting irritation may in time cause hypertrophy. According to some observers, the normal size of the clitoris is greater in the tropics than in temperate climates. Winckel states that it "is also enlarged among the Abyssinians, Suzees, Mandingos, the androgynous and lascivious women, and to such an extent among the first named races as to sanction the custom of removing it with the knife." Notwithstanding the statements of some writers, it is unlikely that masturbation is ever a cause of hypertrophy. Syphilitic infection is occasionally a cause, and for that reason hypertrophy of the clitoris is more frequently met in prostitutes.

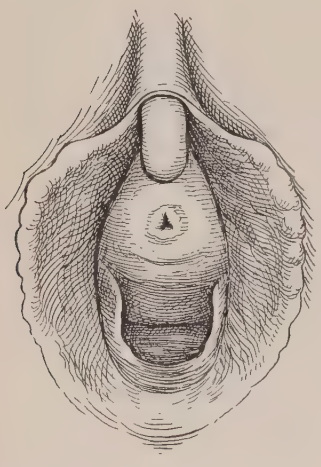


FIG. 192.—HYPERTROPHY OF THE CLITORIS.

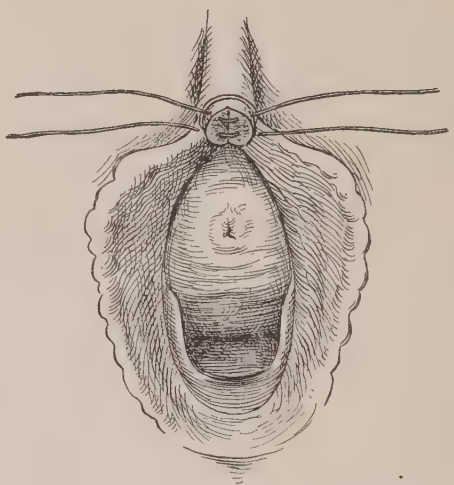


FIG. 193.—OPERATION FOR HYPERTROPHIED CLITORIS. Shows wedge-shaped incision and sutures in place.

Symptoms.—The hypertrophy varies from a slight enlargement to the size of a normal penis, and the clitoris may possess the power of erection. If adhesions exist between the labia and the clitoris is greatly enlarged, the sex of the individual may be concealed. Hypertrophy of the clitoris usually causes no inconvenience, but in some cases it may interfere with sexual intercourse or deflect the stream of urine from its normal course, and it may also become irritated and inflamed, causing itching, burning, edema, and excoriations.

Treatment.—When the hypertrophy is moderate and causes no local symptoms, treatment is not indicated. Inflammation is relieved by rest, by local applications of lead-water and laudanum, and by hot sitz-baths. Excoriations should be painted with a solution of nitrate of silver (gr. xx to f℥j) and covered with carbolized oxid of zinc ointment. The itching should be treated in the manner already described under pruritus vulvæ on page 184.

Excessive hypertrophy may require amputation. The hypertrophied portion of the clitoris is removed by a wedge-shaped incision and the wound closed by interrupted sutures of catgut.

TUMORS OF THE CLITORIS.

Tumors of the clitoris are very rare. Cystic growths have been observed several times, and they generally contain a bloody fluid and may grow to the size of a hen's egg or even larger. Horny and enchondromatous tumors have been met and various forms of malignant and benign growths have been reported from time to time.

Treatment.—The treatment is based upon general surgical principles. Evacuation of the contents of a cystic tumor should be tried before resorting to resection, as these growths have been known to disappear permanently after they have been tapped and their contents withdrawn.

ADHESIONS OF THE LABIA.

Adhesions of the labia occur more frequently during infancy, childhood, senility, and in the unmarried state than in women who are bearing children, and, as a rule, they exist between the nymphæ, but in rare cases the labia majora may also become united. In most instances the vulvar orifice is not completely closed and there is a small opening left immediately below the urinary meatus.

Causes.—Inflammation, irritating discharges, and uncleanliness are the most common causes. The organs may be simply glued or cemented together by abnormal secretions, and in some cases there may be a firm organic union due to the destruction of the protective epithelium of the skin. Sometimes labial adhesions are congenital.

Symptoms.—The patient may complain of a feeling of irritation or discomfort; the stream of urine may be directed upward; and the menstrual flow may be retained in the vagina or discharged with more or less difficulty. Sexual intercourse may be impossible, difficult, or painful, or it may take place through the urethra, and should pregnancy occur the adhesions may form an obstruction to the delivery of the child.

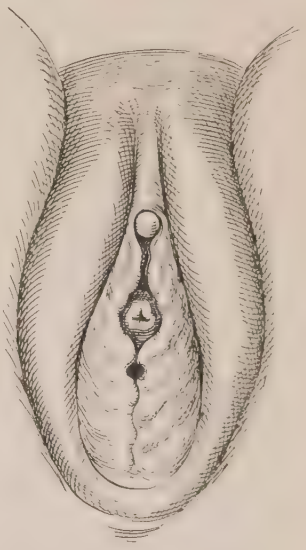


FIG. 194.—ADHESIONS OF THE LABIA.

Treatment.—If the labia are simply glued together by secretions, they are forcibly separated with the thumbs and a vaginal douche of corrosive sublimate (1 to 2000) given. The labia are then separated with a pledget of lint covered with carbolated vaselin and the parts protected with a compress secured by a T-bandage. Fresh dressings should be applied every day, or oftener, if necessary, for at least one week.

If the adhesions are firm and well organized, they must be separated by a cutting operation. A grooved director is introduced through the opening below the urethra and the labia divided with a scalpel along the line of false union.

When no opening is present below the meatus, the urethral canal is held out of the way with a sound and the parts put upon the stretch by lateral pressure with the thumb and index-finger. An incision is then made between the adherent labia with the scalpel and the index-finger introduced into the opening, which is now extended along the line of false union (Figs. 195, 196, and 197).

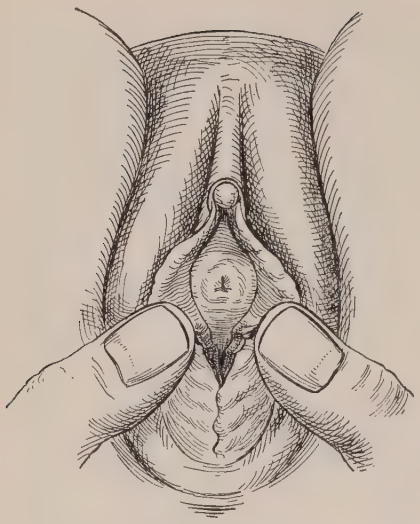


FIG. 195.

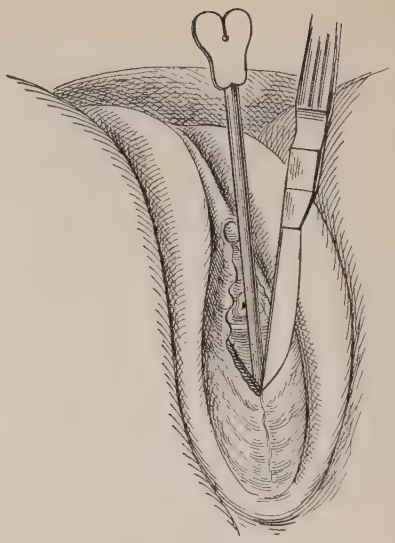


FIG. 196.

OPERATION FOR ADHESIONS OF THE LABIA (page 207).

Fig. 195 shows the adhesions being forcibly separated with the thumbs; Fig. 196 shows the adhesions being divided with a scalpel.

The dressings and the after-treatment of a cutting operation are the same as in cases treated by forcible separation of the adhesions with the fingers.

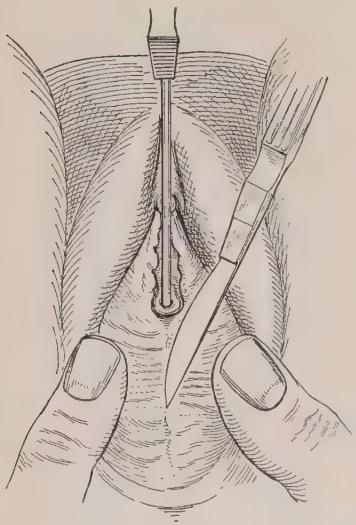


FIG. 197.—OPERATION FOR ADHESIONS OF THE LABIA (page 207).

Shows the method of dividing the adhesions when no opening is present below the urethra.

HERPES.

Definition.—Herpes is an acute inflammatory affection which is non-contagious and marked by the formation of groups of vesicles situated upon an inflamed base.

When the affection attacks the vulva, it is known as *herpes progenitalia*, and corresponds with *herpes preputialis* in the male; it is called *herpes gestationis* when it occurs during or immediately after pregnancy.

Causes.—The disease usually occurs during adult life and has also been observed in young girls. It is frequently found in connection with menstruation, especially in fat or neurotic women, and prostitutes often suffer with herpes on account of the constant irritation to which the genital organs are subjected. Conditions producing congestion and inflammation in the genito-urinary tract and pelvic organs are often causes of herpes. Digestive disturbances, atmospheric changes, cold, nervous depression, and local irritations due to a want of cleanliness or acrid discharges are frequently found to be the exciting causes. Herpes may also occur in con-

nection with pregnancy. Usually, the affection is liable to attack women with a delicate or irritable skin and those who suffer from an excess of uric acid.

Symptoms.—The affection is usually preceded by local premonitory symptoms of tenderness, pain, burning or itching, and in some cases there may be headache, fever, and a sensation of chilliness. Herpes may also occur during an attack of fever. When the disease is caused by congestion of the parts at the time of menstruation, the eruption generally appears every month about two days before the flow. *Herpes gestationis* usually appears about the third or fourth month of pregnancy, and it has also been observed as early as the third or fourth week. In some cases the eruption becomes greatly aggravated a few days before labor and occasionally it does not make its appearance until after confinement.

The lesions of herpes begin as small vesicles about the size of a pinhead which are situated on an inflamed base and contain a clear serous or a seropurulent fluid. They are arranged in groups and are usually few in number. In other parts of the body the vesicles do not rupture, as a rule, but gradually dry up and form yellowish-brown scabs or crusts which fall off in a week or ten days leaving a slightly reddened surface. When the eruption occurs on the vulva, the heat, moisture, and friction of the parts cause the vesicles to rupture shortly after they appear, and small ulcers are left which are slow in healing. These excoriations generally coalesce and the discharges may become offensive in odor and purulent in character. The pruritus, which is a more or less constant symptom, may at times be very severe, and the rubbing and scratching may cause a violent inflammation of the vulva accompanied by edema, thickening of the tissues, and enlargement of the glands of the inguinal region.

Herpes generally attacks the internal surfaces of the labia majora, the nymphæ, the prepuce of the clitoris, and the vestibule, especially in the neighborhood of the meatus urinarius, and the eruption may also be found on the mons veneris, the external surfaces of the labia majora, and in rare instances on the vagina or the cervix uteri.

Differential Diagnosis.—Herpes must be distinguished from eczema and venereal ulcers.

Eczema.—In eczema the vesicles are smaller and less flattened, the skin is more swollen, and there is a tendency of the disease to extend. In herpes the vesicles occur in successive crops arranged in groups or clusters; they are situated on an inflamed base and seldom dry up without rupturing when situated on the vulva. The course of an attack of herpes is short.

Venereal Ulcers.—A differential diagnosis between these ulcerations and herpes is easily made if the case is seen before the herpetic vesicles rupture, but it becomes a more difficult problem to solve during the ulcerative stage of the latter affection, especially in aggravated cases which are accompanied with violent inflammation, edema of the parts, and involvement of the inguinal glands, and under these circumstances it may be necessary at times to reserve our opinion and await developments. The diagnosis depends upon the history of the case and a careful study of the characteristics of the local lesions.

Chancroids give a history of sexual intercourse and generally appear within five or six days, never later than ten or twelve days, after exposure. They are rapid in development, usually multiple, and seldom involve more than one lymphatic gland at a time. The ulcers are highly inflamed; they have abrupt, "punched-out," undermined margins; they are painful to the touch; and their bases, which are not indurated, are at first smooth, but soon become granulated and discharge a profuse, purulent, and auto-inoculable secretion. In *herpes* there is a history of similar attacks. The ulcers are superficial; they show no

tendency to spread or become excavated; and there is no characteristic involvement of the inguinal lymphatics, as is the case in chancroids.

A *chancre* develops slowly; it is single; not painful to the touch, and has a definite period of incubation. Its base is indurated and the margins of the ulcer are sloping. The secretion is scanty, thin, and not auto-inoculable, and several of the inguinal glands become enlarged, but they are not tender and seldom suppurate. In *herpes* the ulcerations disappear in the course of several days without any involvement of the inguinal lymphatics, and there is a history of previous similar attacks.

Prognosis.—Herpes usually lasts from one to two weeks and relapses are less frequent in women than in men. In herpes gestationis relapses generally occur in subsequent pregnancies. A severe systemic disease will sometimes temporarily prevent the appearance of recurrent herpes and the affection will not return until the patient regains her usual health.

Repeated attacks of herpes may cause mental and physical depression in neurotic and nervous women.

The ulcerations occurring in herpes are generally superficial and seldom cause scars.

Treatment.—The treatment is divided into (1) the general, and (2) the local.

General Treatment.—The predisposing causes of the affection must be removed when possible, and the general health and hygienic conditions of the patient carefully studied. The bowels, the kidneys, the digestion, the diet, and the amount of bodily exercise must be considered and appropriate treatment and directions given to meet the indications in each case.

During the acute stages of the disease walking or exercise of any kind must be forbidden, as the excoriations and inflammation are aggravated unless the parts are kept at rest. During the interval between the relapses, however, both indoor and outdoor exercises must be taken by the patient. The character of the internal medication depends upon the indications, and is chiefly directed toward regulating the various functions of the body and removing systemic conditions which may be the exciting causes of the disease. Among the drugs, given internally, which are especially beneficial in the treatment of herpes for their general tonic and alterative effects are the mineral acids, cod-liver oil, arsenic, iron, and quinin.

Local Treatment.—The local treatment of herpes progenitalis is more important than when the affection attacks other parts of the body, as the eruption is often so altered and changed by the heat, moisture, and friction of the parts that the disease becomes aggravated and difficult to manage. It is necessary, therefore, to remember that the local treatment must be carefully directed, and the indications clearly understood not only by the surgeon but by the patient as well.

Careful attention to cleanliness and rest are necessary in the treatment of herpes. The vagina and vulva should be douched twice daily with a solution of corrosive sublimate (1 to 2000 or 4000), followed by warm normal salt solution. A hot sitz-bath exerts a beneficial effect upon the disease and is also very soothing to the parts. A dry vaginal tampon of cotton-wool should be employed to protect the vulva from uterine or vaginal discharges which may be present, and the labia should be separated by a pledget of lint which is held in position with a compress secured by a T-bandage. Absolute rest in bed is not necessary unless the disease becomes severe and inflammation develops.

When the case is seen early, an attempt should be made to abort the vesicles. Salicylic acid (5 per cent.) is very useful for this purpose and frequently gives

good results. It should be combined with vaselin and applied as an ointment or dissolved in alcohol and painted over the affected part. Ichthyol or resorcin (10 to 20 per cent.) combined with glycerin also exerts a good effect, and should be applied by means of a lint compress.

Another method which is successful in these cases is to puncture the vesicles and touch them lightly with a pointed stick of nitrate of silver, or the seat of the eruption may be painted with a 10 per cent. solution of the same drug. Alcohol alone, applied by means of a compress held in position with a T-bandage and changed several times daily, is very efficacious. One per cent. of thymol or 3 per cent. of resorcin or menthol may be combined advantageously with the alcohol, and if the parts are painful, the addition of 3 per cent. of cocain or 5 per cent. of extract of cannabis indica will relieve the local distress.

When the vesicles are fully formed or have ruptured, dusting-powders give the most satisfactory results. These powders are dusted freely over the vesicles and the parts protected by a compress of absorbent cotton, which is held in position with a T-bandage. The following powders are recommended: Calomel, alone or combined with bismuth; talcum; lycopodium; subnitrate of bismuth; oxid of zinc; aristol; or europhen; and the addition of camphor, morphin, or cocain if there is pain. The use of dusting-powders hastens the drying up of the vesicles, protects the excoriations, and assists in settling the question of diagnosis when chancre or chancroids are suspected, as they have no healing influence upon venereal sores. If the excoriated vesicles are slow in healing, the use of dusting-powders should be discontinued and the parts covered with benzoated oxid of zinc ointment and painted every few days with a solution of nitrate of silver (gr. x to f℥j).

A severe inflammation, accompanied with edema of the vulva and involvement of the inguinal glands, should be treated by absolute rest in bed, the daily use of a hot sitz-bath, and the local application of lead-water and laudanum. After the acute symptoms have subsided active measures are discontinued and the lesions treated in the manner described above.

ECZEMA.

Definition.—"Eczema is a non-contagious, inflammatory affection of the skin, acute or chronic in character, appearing at its beginning in the form of any of the elementary lesions, such as erythema, papules, vesicles, pustules, or a combination of them, accompanied with itching, more or less infiltration, and frequently attended with a discharge and the formation of scales and crusts" (John V. Shoemaker).

It is impossible in a work on gynecology to fully consider the subject of eczema, as the disease appears in so many different forms and varieties, and the practitioner must therefore refer to authorities especially devoted to diseases of the skin for a thorough study of the affection. Eczema will consequently be treated from a purely gynecologic standpoint, and little or no reference will be made to its general etiology or to the clinical picture of the various eruptive phenomena.

Varieties.—The vulva may be the seat of any of the *primary* or *secondary* lesions of eczema. When the affection appears on the organs of generation, it is known as *eczema genitalium.*

Causes.—Eczema of the vulva occurs at all ages; it is more frequent, however, during the child-bearing period and after the menopause. The affection is often overlooked by being mistaken for chafing and other forms of irritation to which the parts are naturally exposed. The vulva is particularly liable to the disease on account of the frequency of local and pelvic conditions which cause more or less chronic irritation and congestion. Thus uncleanliness,

friction of the apposing surfaces, rubbing of the clothing, and the natural moisture and heat of the parts are often exciting causes. Again, eczema may occur during pregnancy or at the menstrual periods, and it may also result from vulvar and pelvic diseases as well as the local irritation produced by a vesicovaginal fistula or diabetic urine.

Symptoms.—Itching or pruritus vulvæ is the most prominent symptom. The patient also complains of pain and a burning sensation in certain varieties of the disease and the health may be seriously affected by the exhaustion due to local distress and loss of sleep.

The objective symptoms depend upon the character of the lesions present. The disease may be mild or severe and acute or chronic; it is more commonly met, however, in the chronic form. It may appear primarily on the vulva or may be due to an extension of the disease from the surrounding parts. Eczema usually occurs on the labia majora, and it may also extend to the mons veneris and lower abdomen; the perineal and anal regions; the inner surface of the thighs; the nymphæ and vagina, and in very rare cases to the cervix uteri.

Differential Diagnosis.—Eczema must be distinguished from lichen, syphilis, pediculosis pubis, ring-worm, prurigo, herpes, paresthesia, and acne.

Prognosis.—Eczema occurring on the genital organs is more obstinate than when it appears on other portions of the body, and the prognosis depends upon its cause and variety as well as the duration of the eruption and the thoroughness with which the patient carries out the general and local treatment.

Treatment.—The treatment is divided into (1) the general, and (2) the local.

General Treatment.—While it is true that in many instances the cause of eczema is purely local in origin, and therefore general treatment is apparently not indicated in every instance, still experience shows that the disease is more often cured when careful attention is given to the state of the patient's health and the nature of her environment.

The general treatment is based upon a careful study of the cause in each case and the selection of the proper remedies to relieve the constitutional condition. Thus, for example, if the eczema is due to an excess of uric acid no local treatment will be successful in curing the eruption so long as the constitutional cause is unrecognized and neglected.

It is important in the treatment of eczema to keep the bowels regular and the kidneys active, and to select the diet with a view to the general indications in each case. It should also be borne in mind that certain articles of food, such as pork, shellfish, cheese, alcohol, etc., have an injurious effect upon the lesions of eczema and should not be used by patients suffering from the disease.

The hygienic conditions of the patient must receive intelligent consideration and careful directions should be given as to the number of hours devoted to sleep, the character of the clothing, the amount and form of exercise, the ventilation of the bedroom, the necessity for plenty of fresh air and sunshine, and the proper methods of bathing.

Local Treatment.—The local treatment is based upon a careful study of the eruption in order to determine the nature and duration of the *primary* and *secondary* lesions and to select the proper remedies in each case.

Local cleanliness is of first importance in the treatment of eczema, and the scabs and scales should be thoroughly removed in order that the medication may be applied directly to the diseased surface. The patient should be instructed to stoop over a basin containing warm water and soap and wash the parts gently with her hand instead of using a sponge or bath towel. The soap must be of good quality, and nothing is better for the purpose than *sapo viridis* (U. S. P.)

or pure castile soap. It must be borne in mind that soap is not always beneficial in cases of eczema and that it sometimes causes irritation. Under these circumstances the use of soap should be discontinued and a warm alkaline or emollient sitz-bath substituted. The alkaline bath consists of one ounce of bicarbonate of sodium or potassium to five gallons of warm water and the emollient bath of half a pound of starch, linseed, bran, or gelatin to the same quantity of fluid.

If the scales or crusts are difficult to remove by the methods mentioned above, a bland oil, such as linseed, cotton-seed, or olive oil, should be spread freely over the affected parts, and when the secondary products are softened the vulva is cleansed with green soap (U. S. P.) and warm water.

It is impossible to describe a definite plan of local treatment in eczema of the genital organs, as a certain remedy may prove beneficial in one case and injurious in another, and besides much depends upon the variety and stage of the eruption. In a general way, therefore, the object of the treatment is to relieve the inflammatory conditions and cure the disease by (*a*) cleanliness; (*b*) rest; (*c*) the direct application of medical agents; and (*d*) the use of the *x*-rays.

Acute Eczema.—Cleanliness.—Acute cases, as a rule, are more or less aggravated by the use of warm water and soap, and consequently alkaline or emollient sitz-baths should be employed. These baths not only keep the parts clean, but they are also soothing in their action and allay the inflammation, pain, and itching. They should be employed several times daily and the water should be hot, as a tepid bath does not give good results.

Rest.—Local rest is very important in the treatment of acute eczema, and unless it is enforced many cases are aggravated and pass into the chronic stage that could otherwise be easily cured. The external organs may be put at rest by inserting a small piece of lint between the labia and applying a T-bandage, or by placing the patient in bed. If the symptoms are severe, the latter method is indicated; and in mild cases the former plan fulfils all the requirements.

The Application of Medicinal Agents.—The remedial agents generally employed are sitz-baths, lotions, ointments, dusting-powders, and oils.

Hot alkaline or emollient sitz-baths are especially valuable, and should be given two or three times daily for five to ten minutes according to the indications. They are indicated when the inflammation is severe and the subjective symptoms are urgent, and are also useful as a routine treatment in most cases.

Sedative and astringent lotions serve a beneficial purpose and are applied by means of lint compresses which are held in position with a T-bandage. When water is used as the vehicle, it should be soft (distilled), as a hard water irritates the parts and increases the local inflammation. Hot or cold fomentations of distilled water are a simple and effective plan of treatment to relieve inflammation and allay the pain and pruritus. Lead-water and laudanum are also useful for the same purposes. The following sedative and astringent lotions are recommended: Equal parts of lime-water, glycerin, and distilled water (especially useful when the affected part is irritable, hot, and dry); bicarbonate of sodium or potassium, two drachms to one quart of distilled water (lessens serous oozing and relieves the burning and pruritus); weak solutions of alum or tannic acid; sulphid or hyposulphite of sodium, two drachms to one quart of water; a saturated solution of boric acid; a weak solution of thymol or carbolic acid; black or yellow wash; and diluted hydrogen peroxid.

Sedative or astringent ointments are more suitable in the majority of cases than lotions, and may be applied directly to the part or first spread upon a piece of lint which is held against the vulva by a T-bandage. Lanolin or one of the

simple cerates, or both combined, form the best base for ointments, and they should always be employed, as preparations of petroleum have little or no absorptive qualities. Good results are obtained from the use of zinc, in the form of either the carbonate or the oxid. The benzoated oxid of zinc ointment is also useful, and good results are derived from one drachm of subnitrate of bismuth to half an ounce each of lanolin and cold-cream. Goulard's cerate and the ointment of carbonate of lead are both effective preparations. The addition of chloral, morphin, camphor, or menthol to an ointment is indicated to relieve pruritus and lessen pain. The oleates of lead, zinc, bismuth, and aluminium have been found serviceable in the treatment of eczema, and should be used with equal parts of lanolin or simple cerate.

Dusting-powders protect the affected parts, exert a sedative, astringent, and curative influence, and absorb the secretions when the eruption is accompanied by serous oozing. The following are recommended for their soothing and protecting qualities: Starch, boric acid, lycopodium, talcum, rice powder, and arrow-root. Subnitrate of bismuth, salol, calomel, and oxid or oleate of zinc are stimulating or astringent in their action and should be employed when a decided effect is desired. The addition of camphor, chloral, or morphin to the powder lessens the pruritus and relieves the pain.

Bland oils may be used alone or in combination with sedative or astringent drugs in the treatment of acute eczema. The following oils have been employed with good results: Cotton-seed, olive, palm, linseed, and almond oil. The oil should be gently rubbed over the affected skin and the parts protected with a lint compress secured by a T-bandage.

The Use of the *x*-rays.—The *x*-ray treatment of eczema is fully discussed on page 77.

Chronic Eczema.—Cleanliness.—Warm water and soap are the best means at our disposal for cleansing the part and removing the secondary lesions and foreign material. Alkaline and emollient baths are also serviceable when soap irritates the affected skin and cannot be employed. If the scales and crusts are difficult to remove, a bland oil is spread over the parts, and when the secondary products are softened the vulva is cleaned with soap and warm water.

Rest.—In chronic eczema rest is not so important as in the acute form of the disease, and hence it is seldom necessary or advisable to place the patient in bed. The parts, however, should be supported by inserting a piece of lint between the labia and applying a T-bandage. Sexual rest is clearly indicated in all cases, as coitus causes congestion and increases the severity of the local symptoms.

The Application of Medicinal Agents.—The local remedies employed in chronic eczema should be sedative, astringent, or stimulating in character. In the chronic form of the disease the skin is inactive and the blood-vessels and lymphatics require stimulation, and hence many remedies are used which would be contraindicated in the acute variety. The remedial agents employed are sitz-baths, lotions, soaps, ointments, and dusting-powders.

Hot sitz-baths are of great service, and they should be alkaline, emollient, or stimulating in character. Corrosive sublimate, 1 to 2000 or 5000; carbolic acid, 1 to 3 per cent.; and creolin, one drachm to every quart of water, are the best drugs to use for a stimulating sitz-bath.

Lotions are very effective and should be sedative, astringent, or stimulating in character. Hot or cold fomentations of distilled water, lead-water and laudanum, and the various sedative and astringent lotions referred to in the treatment of acute eczema are beneficial in the chronic form when used as indications arise. Stimulating lotions, however, are more frequently indicated on account of the sluggish action of the skin and the chronic condition of the eruption. A

solution of bichlorid of mercury, 1 to 5 grains to the ounce, will often allay the inflammation, itching, and pain. Carbolic acid, 1 to 3 per cent.; creasote; lysol, 0.5 to 1 per cent.; thymol, 5 to 15 grains to the ounce; or creolin, 2 drachms to the quart, are useful and effective remedies. Boroglycerid is a valuable application, and an alcoholic solution of menthol (gr. xx to f℥j) has a decided effect in relieving the pain and itching. A 5 per cent. solution of chrysarobin in liquor guttæ-perchæ (1 part of gutta-percha in 10 parts of chloroform) will at times act beneficially and effect a cure.

Soap is an important agent in the treatment of eczema, not only for its cleansing effect in removing foreign material and secondary products, but also on account of its stimulating action upon the diseased skin. Potash or soft soap (*sapo viridis*, U. S. P.) used two or three times daily with warm water is an excellent remedy and may produce good results. If a hard or soda soap is employed, it must be pure and neutral. Soap may be advantageously combined with various drugs to increase its therapeutic effects, and may therefore be medicated with sulphur, naphthol, tar, bichlorid of mercury, salicylic acid, lysol, and carbolic or boric acid.

The sedative and astringent ointments which are recommended in the treatment of acute eczema may be useful under certain circumstances in the chronic form of the disease. Stimulating preparations, however, are especially indicated, and diachylon ointment serves a useful purpose in these cases. Good results are also obtained from the use of salicylic acid, carbolic acid, resorcin, creasote, ichthyol, thymol, menthol, aristol, europhen, chrysarobin, naphthol, bichlorid of mercury, oil of cade, sulphur, and camphor. The addition of morphin, chloral, menthol, or camphor to the ointment lessens the pain and relieves the pruritus.

Dusting-powders are used in the same manner and for the same reasons as in the acute variety.

The Use of the *x*-rays.—The *x*-ray treatment of chronic eczema is fully discussed on page 77.

THRUSH.

Thrush of the vulva and vagina is due to the *saccharomyces albicans*, an organism which is the cause of parasitic stomatitis. The disease is met most often in nursing women and in those who are exhausted from diabetes, malignant disease, or tuberculosis.

The affected parts are covered with slightly elevated whitish spots or aphthæ which have a tendency to coalesce and eventually leave small shallow ulcers, which are not painful unless they become irritated. The color of the spots is not constant and it may change to a yellow or brown from slight extravasations of blood.

The *prognosis* is favorable except in women who are suffering from a grave constitutional chronic disease.

Treatment.—The vagina and vulva should be douched twice daily with a solution of corrosive sublimate (1 to 2000) followed by a quart of hot normal salt solution and the introduction of a vaginal tampon saturated with a 25 per cent. solution of ichthyol in glycerin. The vulva should then be dusted with a powder composed of equal parts of aristol, calomel, and subnitrate of bismuth and the labia separated with a piece of lint which is secured by a compress and T-bandage.

When the ulcers are slow in healing a solution of nitrate of silver (gr. x to f℥j) should be applied, and if the discharges become offensive from fetid particles adhering to the aphthous patches, the parts should be washed several times a day with hydrogen peroxid.

The internal medication depends upon the constitutional conditions com-

plicating the affection. Fractional doses of calomel or bichlorid of mercury should be employed for its specific effect upon the local lesions.

SIMPLE DERMATITIS.

Synonyms.—Dermal vulvitis; Intertrigo; Chafing.

Definition.—A simple inflammation of the skin involving only the epidermis and the superficial layer of the derma.

Causes.—The affection is most frequently observed in fat or fleshy women and occurs primarily where the skin surfaces of the vulva and surrounding parts are in apposition or thrown into grooves or folds. The constant chafing and friction to which the parts are subjected in fat women is very apt to cause a dermatitis, especially when the natural secretions and leukorrheal discharges are allowed to collect in the cutaneous folds and undergo decomposition.

Symptoms.—The local condition varies between a simple erythema and a severe inflammation. In aggravated cases the surface of the affected part is excoriated and covered with a serous discharge. The amount of physical discomfort depends upon the degree of inflammation, and in some cases the parts are so painful that any form of motion is impossible, while in others the patient only complains of tenderness and pruritus.

Prognosis.—The condition is readily relieved by proper treatment and attention to cleanliness. It must not be forgotten, however, that the predisposing cause is always present in fat women, and that a relapse may occur at any time, especially in hot weather, from friction of the apposing surfaces.

Treatment.—In simple cases of chafing the parts should be washed two or three times daily with warm water and soap and thoroughly dried. They are then covered with a bland dusting-powder, such as equal parts of calomel, rice powder, and subnitrate of bismuth, and protected by a compress of lint. Lycopodium, talcum, oxid of zinc, and starch powder, alone or in combination, are also valuable substitutes, and should be employed when the indications arise.

If the parts are excoriated they should be cleansed as described above and a stimulating ointment applied, which is covered with a piece of lint held in position by a T-bandage. The following ointment is useful:

℞. Bismuthi subnitratis, ... ℥iss
Acidi carbolici, ... gtt. xij
Lanolini, ... ℥ij
Unguenti zinci oxidi, ... ℥vj
M. Sig.—Apply locally.

It may be necessary in some cases to stimulate the excoriated surfaces with a solution of nitrate of silver (gr. x to f℥j) and after the acute symptoms have subsided to cover the parts with a dusting-powder.

Rest in bed for a few days even in mild cases of dermatitis is a great help in the treatment, and should be resorted to whenever the patient can afford the time. If the patient is around attending to her usual duties, the apposing surfaces should be separated by a piece of absorbent lint and a compress applied which is held in position with a T-bandage.

Careful attention to cleanliness and the constant use of dusting-powders are necessary to prevent relapses.

PRURIGO; LICHEN; ACNE.

For the description and treatment of these diseases the reader is referred to works on diseases of the skin.

The use of the *x*-rays in the treatment of prurigo, lichen, and acne is fully discussed in Chapter VI.

ERYSIPELAS.

Definition.—An acute, specific, contagious inflammation of the skin, subcutaneous tissues, and mucous membranes.

Causes.—The specific cause of erysipelas is the *streptococcus erysipelatis* of Fehleisen. The cocci gain access to the tissues through an injury of the skin or mucous membrane, and are conveyed to the seat of infection by the atmosphere, clothing, unclean hands and instruments.

The following predisposing causes are important and will be briefly considered.

Sex.—The disease is more prevalent in males than in females. Recurrent attacks are occasionally observed in women at the time of the menstrual periods. Erysipelas is also a source of puerperal infection.

Age.—The disease is most frequent between the ages of twenty and fifty years. Erysipelas of the vulva has been observed in infants from a primary infection of the umbilical cord.

Season of the Year.—Dr. J. M. Anders has shown from an exhaustive study of the subject that the disease is more prevalent during the spring and autumn than during other seasons of the year.

Former Attacks.—Recurrent attacks, which are occasionally observed, are accounted for upon the theory that the cocci remain dormant at the point of original infection, and become active again from some exciting cause, such as the periodic congestion of menstruation.

Vulvar Diseases.—Various diseases of the vulva, such as eczema, herpes, and inflammation, and certain ulcerative conditions which are accompanied by excoriations, erosions, abrasions and ulcerations, are predisposing causes.

Injuries.—Traumatisms of the skin and mucous membrane of the vulva, resulting from chafing, surgical operations, labor, and sexual intercourse and many other similar causes, offer points of entrance to the cocci.

Unhygienic Conditions.—An unhealthy environment and insufficient food and all general influences which have a tendency to lower the state of the system undoubtedly predispose to the disease.

Varieties.—Erysipelas of the vulva, as in other parts of the body, may occur in several varieties on account of certain conditions altering the typical course of the disease. Thus the affection may extend to distant or neighboring parts (*erysipelas migrans*); suppuration may occur in the vesicles (*erysipelas pustulosum*); subcutaneous suppuration may take place (*phlegmonous erysipelas*); or an intense infiltration of the connective tissue may produce gangrene (*gangrenous erysipelas*).

Symptoms.—The symptoms are divided into (1) the general, and (2) the local.

General Symptoms.—The disease usually begins with a chill or sensations of chilliness. In children convulsions are apt to occur in place of the rigor. Slight nausea is an early symptom and may be accompanied with vomiting. The temperature rises at once and ranges between 102° and 104° F. or even higher, reaching its highest point on the third day. It begins to decline rapidly to normal on the seventh day, and may even become subnormal in severe cases, on account of the general systemic depression caused by the disease. Occasionally even after the temperature has declined to normal there may be a fresh extension of the inflammation without causing a febrile reaction, although, as a rule, the fever returns. The pulse is rapid, varying from 100 to 120 or higher, and usually soft and of good volume unless the inflammation is of a severe type, when it shows a tendency to weakness. The tongue is heavily coated with a

yellowish-white fur; the skin is feverish; the urine is high-colored and scanty, containing an excess of urates and in some cases a slight amount of albumen; and the bowels are generally torpid, although diarrhea may occur as a late symptom. If the disease assumes a malignant type, the symptoms become grave and the typhoid state rapidly develops.

Local Symptoms.—The affected part first becomes swollen and has a polished appearance, and the patient complains of pain, heat, pruritus, and tension. Usually within twenty-four hours the characteristic eruption develops and a red spot appears on the skin which disappears temporarily on pressure. The inflammation and swelling rapidly increase in severity and spread to the surrounding tissues, and the affected parts become infiltrated. The margins of the inflamed area are clearly defined, but irregular, and small red spots and streaks are seen extending into the healthy skin. Vesicles varying in size and containing serum now appear and spread over the affected part (*erysipelas vesiculosum*). The inflammation, as a rule, reaches its greatest intensity on the third day, when it begins gradually to subside, and at the same time the swelling disappears, the vesicles dry up, and the color of the skin changes from a red to a reddish-yellow hue. In from ten days to two weeks convalescence occurs and desquamation of the epidermis begins.

Diagnosis.—The diagnosis is not difficult after the disease is fully established. It may, however, occasionally be mistaken for acute eczema and erythema. In *eczema* the inflammation is scattered; the surface is covered with very small vesicles or scales; the swelling is very slight; the itching is intense; and there are no constitutional symptoms. In *erythema* the inflammation is superficial, diffused, and unattended with pain; the constitutional symptoms are absent; and the affected parts are not swollen.

In the *phlegmonous* variety the usual local symptoms of deep-seated suppuration are present and the constitutional manifestations are accentuated. In the *gangrenous* form of the disease the inflammation is severe and masses of broken-down or necrotic tissue are observed on the affected surfaces.

Prognosis.—The prognosis, as a rule, is favorable, although certain conditions and complications may render the case very grave. Erysipelas of the vulva occurring during the puerperal state is usually fatal, and the gangrenous variety generally ends in death. The phlegmonous form is very slow in its course and has an increased mortality. The prognosis is unfavorable when the disease occurs in old women or in alcoholic subjects and when it is associated with an acute or chronic disease which impairs the vitality of the system.

The hair on the vulva frequently falls out and shortly after desquamation it begins to grow in again gradually. Erysipelas may have a curative influence upon lesions situated within the area of infection, and it has been known to cure ulcerations due to lupus, cancer, and sarcoma, as well as to cause the disappearance of chronic skin affections.

Treatment.—The treatment is divided into (1) the general, and (2) the local.

General Treatment.—If the patient is young and strong, the bowels should be opened early with calomel followed by a saline, but in asthenic cases violent purgation does harm by still further depressing the vital powers, and a mild laxative or an enema should therefore be employed. Absolute rest in bed with the use of a bed-pan is important, and the patient should not be allowed to move about under any circumstances on account of the inflamed condition of the parts.

The strength of the patient should be guarded and sustained by every means at our disposal. While this is especially important in severe cases, it is also

necessary in mild ones, and therefore careful attention must be given to the diet and to the administration of stimulants. The food should be easily digested and nourishing and taken at short intervals, and while the fever is high it should be given in a liquid form. As nausea and vomiting are frequent symptoms in the early stage of the disease, the stomach may not be able to retain nourishment, and it will be necessary for the time being to resort to rectal feeding. Alcohol and strychnin are the most useful stimulants to employ; they should not be given, however, as a routine practice, but reserved until the indication for their use arises. In severe cases and in asthenic conditions whisky or brandy combined with strychnin should be freely administered, and if nausea or vomiting is present a dry champagne should be given as a substitute in small quantities at a time. Delirium is not necessarily a contraindication to the use of alcoholic stimulants.

When the temperature becomes high, it should be kept down by the use of an ice-cap and sponging. Antipyretics, except in the form of alcohol, are contraindicated, and should not be employed on account of their depressing action upon the heart. Sleeplessness is controlled by the use of bromids or morphin, alone or in combination.

The use of drugs internally is disappointing in the majority of cases, and our chief reliance must therefore be placed upon the diet and stimulation. In strong healthy subjects the use of hydrochlorate of pilocarpin has been highly recommended during the early stage of the disease to lower the pulse-rate and temperature and lessen the intensity of the local inflammation. The drug should be given hypodermically (gr. $\frac{1}{8}$ to $\frac{1}{6}$) every four hours until three doses are administered. Large doses of the tincture of ferric chlorid and quinin are also beneficial, and Dr. J. M. Anders claims that small doses of bichlorid of mercury modify the severity of the local and constitutional symptoms.

The administration of an antitoxin in cases of erysipelas is still in the experimental stage, and its results are as yet uncertain.

Local Treatment.—The vulva and vagina should be douched with a warm solution of corrosive sublimate (1 to 4000), followed by normal salt solution, and the parts gently dried with sterile absorbent cotton. A vaginal cotton-wool tampon is then introduced and an ointment of equal parts of ichthyol and lanolin rubbed well into the inflamed area. A piece of lint smeared with the ointment is now placed between the labia and over the vulva and secured by a T-bandage.

The parts should be douched and dressed with the ointment twice a day, and when the inflammation begins to subside, benzoated oxid of zinc ointment should be substituted and its use continued until desquamation ceases. A bland sedative dusting-powder should then be employed and the douches continued for two or three weeks.

When the pain and local irritation are very severe, lotions of lead-water and laudanum serve a useful purpose, and hot fomentations of corrosive sublimate, 1 to 5000 or 10,000, or a 2 to 5 per cent. solution of carbolic acid also give good results. Dr. John V. Shoemaker recommends the oleate of bismuth very highly as a sedative for the relief of the pain and burning which accompany the affection.

In addition to the ichthyol ointment already referred to, various methods have been advised for the purpose of limiting the spread of the inflammation, and one of the best means is a lotion of corrosive sublimate, 1 to 5000, or a 5 per cent. solution of carbolic acid applied continuously to the part upon a lint compress. Excellent results have also been obtained from the use of an ointment of protargol and lanolin (gr. xx to ℥j), which is smeared on a piece of lint and applied to the seat of disease. Another plan is to lightly scarify the healthy skin around the diseased

area and then apply the corrosive sublimate or carbolic acid lotion. The scarification must be very superficial and the lines should cross each other at right angles. Finally, hypodermic injections of a few drops of a solution of corrosive sublimate, 1 to 4000, or a 3 per cent. solution of carbolic acid into the skin immediately around the eruptive patch has in some instances limited the extension of the disease and checked the inflammation.

The use of a compress and T-bandage to support the vulva adds greatly to the comfort of the patient and has a tendency also to prevent the inflammation from spreading.

When convalescence is fully established, reinfection should be guarded against by careful disinfection of the entire body and a change of clothing and bedding.

DIPHTHERIA.

Definition.—Diphtheria of the vulva is an acute, infectious disease due to the *Klebs-Löffler bacillus* and characterized by the formation of a fibrinous exudate upon the vagina and inner surfaces of the external organs of generation. In children the disease is generally secondary to an infection of the pharynx and upper air-passages, although it has been known to attack the vulva alone. In adults the disease is usually a primary infection of the vulva occurring during an epidemic or the puerperal state, and in some instances the bacilli have been introduced during an examination of the vagina or an operation upon the organs of generation. And, finally, the patient may infect her vulva through careless attention to cleanliness while nursing a child suffering with diphtheria of the air-passages.

Symptoms.—The constitutional symptoms differ in no way from those which are present when the infection attacks other portions of the body. Locally the vulva is tender and swollen and its inner surfaces are covered with the characteristic exudate.

Diagnosis.—The diagnosis is based upon the history of the case; the character of the constitutional symptoms; the appearance of the exudate; the frequent presence of albumen in the urine; and the bacteriologic examination.

Treatment.—The constitutional treatment is the same as when the disease attacks the air-passages, and includes hygienic measures, nursing, stimulation, and feeding. Antitoxin must be administered early.

The local treatment consists in spraying the vulva and vagina three or four times a day with hydrogen peroxid and douching the parts with a warm solution of corrosive sublimate (1 to 4000), followed by normal salt solution. A compress of lint saturated with hydrogen peroxid is then placed between the labia and over the vulva and secured by a T-bandage. After the exudates have disappeared the lotions of peroxid are discontinued and dusting-powders substituted.

Gangrene or *noma pudendi* is treated in the manner described on page 172.

PSEUDO-DIPHTHERIA.

This variety of vulvar inflammation is characterized by the formation of a pseudo-membrane, and is not due to the *Klebs-Löffler bacillus* but to other organisms, especially the *streptococcus*.

The affection occurs most frequently during an attack of puerperal sepsis and the false membranes are found on the contusions and lacerations of the vulva and vagina caused by labor. A pseudo-membrane is sometimes observed on the vulva during the course of an attack of typhoid fever, scarlet fever, or small-pox when the disease is grave and the patient has passed into the typhoid state.

Symptoms.—There is nothing characteristic in the appearance of the vulva in pseudo-diphtheria when it occurs during the puerperal state except the presence of the false membrane, as the swollen, contused, and lacerated condition of the parts as well as the presence of the purulent discharge are the result of septic infection and traumatism.

Diagnosis.—The diagnosis is based upon the history of the case and the bacteriologic examination.

Treatment.—When pseudo-diphtheria occurs during the puerperal state no special form of treatment is indicated and the general and local septic symptoms are treated in the usual manner without any reference whatever to the presence of the false membrane.

If the disease appears during the course of one of the eruptive fevers, the vulvar lesions should be treated actively and the same local measures carried out as in the case of true diphtheria of the vulva (see p. 220).

VAGINISMUS.

Definition. — A hyperesthetic condition of the vulvovaginal orifice characterized by painful and spasmodic contractions of the muscles of the pelvic floor, but more especially of those surrounding the vulva and lower part of the vagina. In some cases the spasm involves the levator ani muscle and the muscles of the thighs, and there may also be general convulsive movements of the entire body. The condition is comparatively rare and is always a symptom of a cause which may or may not be discovered.

Causes.—There is generally a local cause for the symptoms, and a large proportion of women who suffer with vaginismus are young, neurotic, and hysteric. The nervous symptoms, however, are often the result of the vaginismus and not the cause. The fact of so many of these patients being young is explained by the majority of the local lesions occurring at the vulvovaginal orifice, where the irritations and traumatisms of early married life are most likely to be met, in the form of an irritable condition of the torn hymen and small ulcerations or fissures. These lesions are constantly irritated by coitus, and eventually become so tender and painful that vaginismus results.

In some cases the origin of the trouble may be a urethral caruncle, a neuroma of the fossa navicularis, varicose veins, or prolapse of the mucous membrane of the urethra, and in others a fissure of the fourchette, the vulvovaginal orifice, the neck of the bladder, or the anus may be the cause. Vaginismus may also be dependent upon an inflammation of the vulva, the vagina, the cervix, or other organs of the pelvis, and it may likewise be due to a prolapse of the ovaries, a displacement of the uterus, or coccygodynia. Lead-poisoning is also said to be a cause, and masturbators are especially liable to the affection on account of the local irritation and general nervous depression which the habit produces.

Many cases where no distinctive local lesion is present are due to ineffectual attempts at sexual intercourse, which in time produce great nervous excitability and local sensitiveness, accompanied by the fear or dread of pain when coitus is attempted. These conditions gradually become aggravated, and some of the severest forms of vaginismus result. Among the causes which bring about this condition of affairs are a rigid or unyielding hymen, a disproportion in the size of the penis and the vaginal inlet, and a loss of erectile power or premature ejaculation upon the part of the male. Again, in some women the vulva is placed too far forward, and the penis, instead of penetrating the vagina, pushes the fossa navicularis and the urethra against the symphysis. Coitus under these circumstances is incomplete, and in the course of time the parts

become eroded and inflamed and the meatus may be sufficiently dilated to admit the penis.

Symptoms.—The intensity of the symptoms varies. In some cases the slightest touch with a feather or the introduction of a urethral catheter causes severe and painful spasms, and in others the phenomenon occurs only when sexual intercourse is attempted or when an examination is made with the finger or speculum. Generally when vaginismus is due to a distinct lesion, such as an irritable or ulcerated hymen, the pain in the beginning is limited to the situation of the local trouble, but gradually the sensitive area extends and the entire surface of the vulva becomes hyperesthetic. In severe cases of vaginismus sexual intercourse or an examination without an anesthetic is impossible.

The contractions are generally located at the vulvovaginal orifice or somewhat within the vagina, and in some instances there may be convulsive movements of the entire body.

Vaginismus may occur suddenly or come on gradually according to the cause and the nature of the lesion which produces it. Thus, it may come on immediately after a brutal intercourse, while it will be slow in developing when the cause is a local lesion or the affection is due to ineffectual attempts at coitus.

Vaginismus is most frequently observed in the newly married, but many cases are also met in women who have borne children.

Women who suffer from vaginismus become nervous and hysteric, their general health fails, and there is more or less mental depression. In a large proportion of cases they suffer from neuralgic dysmenorrhea and the bladder and rectum eventually become irritable.

Diagnosis.—The affection must be distinguished from dyspareunia or painful intercourse. In vaginismus the pain is associated with spasmodic contractions of the muscles of the pelvic floor, while in dyspareunia no contractions occur and pain is the only symptom.

Prognosis.—The prognosis is good. It must be guarded, however, when no appreciable local lesion exists and the patient is neurasthenic or hypochondriacal. The disorder may disappear during pregnancy and reappear after labor; but, as a rule, delivery effects a permanent cure. Cases are on record in which the contractions due to vaginismus interfered with labor and delayed the delivery of the child. Without treatment vaginismus becomes progressively worse and the general health is eventually seriously impaired. Sterility is common.

Treatment.—The treatment is divided into (1) the removal of the cause, and (2) the treatment of the symptoms.

The Removal of the Cause.—The local lesion which is usually the cause of the spasmodic reflexes must be sought for and removed. It is not always possible, however, to find a local lesion, as it may have disappeared spontaneously and left the parts in a permanently irritable condition. Again, cases dependent upon brutal or ineffectual attempts at sexual intercourse present no local lesions, as the symptoms are due to nervous apprehension or fear and become progressively worse as the patient's health fails.

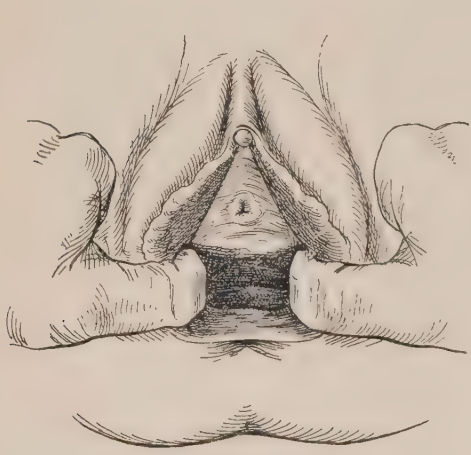
After the removal of the cause the vaginismus, as a rule, remains and requires special treatment. It is good practice, therefore, at the time of operating upon the cause to forcibly dilate the vaginal orifice and insert a glass plug, as described under the *treatment of the symptoms.*

The Treatment of the Symptoms.—In slight cases the hyperesthesia and painful reflex contractions may be relieved by the local application of cocain. A pledget of absorbent cotton is saturated with a 5 per cent. solution of cocain and applied for a few minutes to the lower end of the vagina and over the vulvar

surfaces before an attempt at sexual intercourse is made. This usually relieves the hyperesthesia and permits coitus to take place without pain, and should pregnancy follow a permanent relief from the symptoms may be looked for after labor.

A hot sitz-bath taken night and morning is often beneficial in these cases, and excellent results have followed the daily use of the galvanic current by applying the positive pole to the vulvovaginal orifice and surrounding parts. The spasmodic irritability and hyperesthesia may also be greatly lessened by painting the affected parts twice a week with a solution of nitrate of silver (gr. xx to f℥j); by the use of an ointment of atropin (gr. ij to ℥j); by rectal suppositories of opium and belladonna; and by vaginal suppositories of iodoform (gr. v to x). Good results often follow the use of graduated bougies, which may be inserted into the vagina by the patient herself when she takes the sitz-bath at night and in the morning.

The general health and mental condition of the patient must be looked after



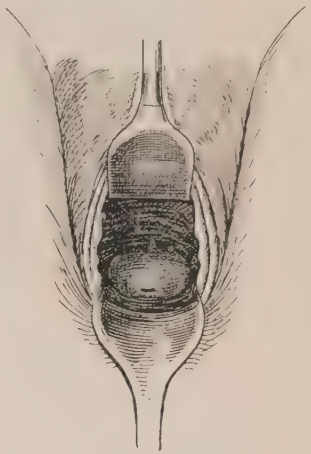


Fig. 198. Fig. 199.

Forcible Dilatation of the Vulvovaginal Orifice.

Fig. 198 shows method of dilating with the thumbs; Fig. 199 shows dilatation being accomplished with Simon's speculums.

and careful attention given to the digestion, bowels, kidneys, and other organs. Carefully regulated exercise is of great importance and the patient must be given definite directions as to its character and duration.

In severe cases of vaginismus sexual excitement must be forbidden and the husband and wife should occupy separate beds. The general health and hygienic surroundings of the patient must be looked after and the amount of physical exercise should receive careful consideration, as a cure is impossible unless the patient is placed in the best possible condition. Forcible dilatation of the vulvovaginal orifice is indicated in these cases, and is usually followed by a cure. The patient is anesthetized and placed in the dorsal position and the vaginal entrance thoroughly stretched by means of the operator's thumbs or the blades of Simon's speculums.

A glass plug is then inserted into the vagina and retained in position for one day while the patient is recovering from the effects of the operation, after which time it is worn for two hours night and morning during a period of from two to

three months. The size of the plug depends upon the dimensions of the vaginal entrance, and it must always be sufficiently large to stretch the parts. If the patient suffers pain when she inserts the plug, it may be relieved by saturating a pledget of absorbent cotton with a 5 per cent. solution of cocain and applying it to the parts.

Gradual dilatation is recommended when the hyperesthesia is not pronounced and when contraindications exist to the use of a general anesthetic. The opera-

Fig. 200.

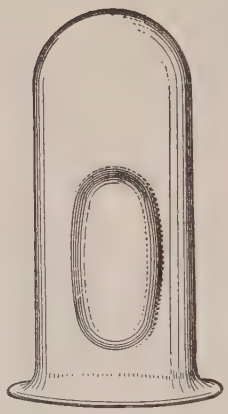


Fig. 201.

Forcible Dilatation of the Vulvovaginal Orifice.

Fig. 200 shows the glass plug in place; Fig. 201 shows Sims's glass plug.

tion should be performed twice a week at the house of the patient and a local anesthetic employed. The blades of a bivalve speculum are gradually introduced into the vagina and slowly extended until the patient complains of pain. The instrument is then withdrawn and the glass plug inserted for several hours. During the interval between the dilatations the glass plug should be introduced into the vagina night and morning and allowed to remain for two hours.

CHAPTER XV.

THE VAGINA.

METHODS OF EXAMINATION.

The vagina can be examined by the following methods:

Direct inspection.
Vaginal touch.
Indirect inspection.
Microscopic and Bacteriologic Examinations.

DIRECT INSPECTION.

Limitations.—The vulvovaginal orifice, the lower portion of the vagina, and the anterior surface of the canal can be examined by direct inspection.

Information.—Direct inspection is one of the most valuable methods we possess for recognizing affections of the vagina, as the majority of the lesions are situated in the lower portion of the canal and can be seen without the use of instruments. Thus, we can diagnose a prolapse of the anterior and posterior wall (*cystocele and rectocele*) as well as a laceration and other pathologic conditions at the vulvovaginal orifice. We can also recognize neoplasms and fistulas

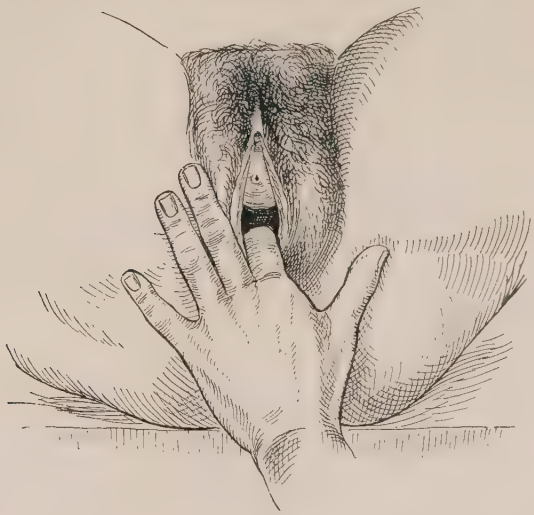


FIG. 202.—DIRECT INSPECTION OF THE VAGINA (page 226).
Exposing the anterior vaginal wall by retracting the perineum with the index-finger.

which are situated in the lower part of the vagina and detect the presence of abnormal discharges.

Preparation of the Patient.—No preparation is required. If a douche is given prior to the examination, the secretions are removed, and hence an incorrect diagnosis may be made.

Position of the Patient.—The dorsal posture is employed in making the examination.

Technic.—After placing the patient in the proper position the examiner sits in front of the vulva and carefully inspects the vaginal orifice, noting the

presence of a laceration and other pathologic conditions. He then instructs the patient to strain or bear down, and if there is any tendency to prolapse of the anterior or posterior wall, the vagina will bulge into the outlet; a cystocele or rectocele can be made more prominent in the same way.

The index-finger of the left hand is then introduced into the vagina with its palmar surface directed downward and the perineum firmly retracted or pulled

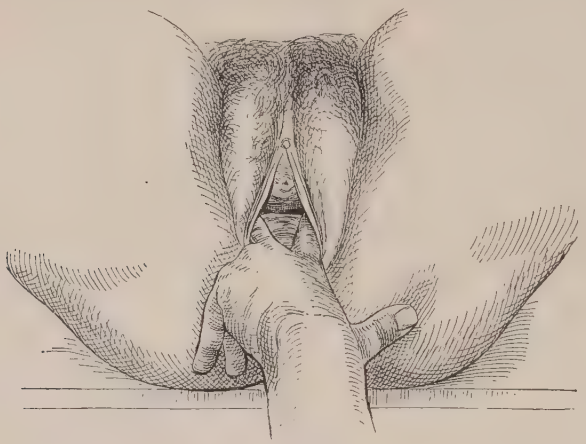


FIG. 203.—DIRECT INSPECTION OF THE VAGINA.
Exposing the posterior vaginal wall by retracting the perineum with the index and middle fingers.

back, when the anterior vaginal wall will come into view and can be carefully inspected (Fig. 202).

The lower portion of the posterior vaginal wall can also be exposed by introducing the index and middle fingers just within the vagina with their palmar surfaces directed downward and retracting the perineum.

VAGINAL TOUCH.

Limitations.—The entire canal of the vagina, from the vulvovaginal orifice to the fornices, can be examined by vaginal touch.

Information.—We can determine the condition of the perineum and the vaginal outlet; the presence of a stricture, a neoplasm, or a prolapse of the walls of the vagina; the position of the fornices; the location and extent of scar tissue, and the accumulation of feces in the rectum.

FIG. 204.—FEMALE BLADDER SOUND.

Instrument.—A female bladder sound.

Preparation of the Patient.—The rectum should be emptied with an enema of soapsuds and water and the urine voided naturally just before the examination. The corsets should be removed and all clothing that constricts the waist should be loosened.

Position of the Patient.—The examination should be made in the dorsal position.

Technic.—The index-finger of the left hand is lubricated with soap and passed under the sheet toward the perineum. As soon as the tip of the finger feels the perineum it is carried upward into the vaginal opening and the palmar surface turned downward. The vulvovaginal outlet is then palpated and the finger passed along the posterior wall of the vagina until it reaches the vault. The finger is then turned with the palmar surface upward and the anterior vaginal wall examined as it is slowly withdrawn.

Vaginal touch should be combined with rectal palpation and sounding the urethra and the bladder in certain lesions of the posterior and anterior vaginal walls. Thus, a rectocele can be recognized by introducing the index-finger into the rectum and hooking it forward so that the tip enters the sacculation, where it can be felt by the vaginal finger and the diagnosis confirmed. Again, a tumor situated in the posterior vaginal wall can be more satisfactorily examined by combining vaginal with rectal touch. A urethrocele or a cystocele can be easily recognized by introducing a sound into the urethra or the bladder and feeling the tip of the instrument in the cele with the vaginal finger. In the same way tumors of the anterior wall of the vagina can be distinguished by palpating them between the vaginal finger and a sound, or by employing vagino-abdominal touch.

INDIRECT INSPECTION.

Definition.—This method of examination requires the use of special instruments, which are known as speculums, and which are introduced into the vagina to expose the surface of the canal.

Limitations.—The entire vagina, from the vulvovaginal orifice to the vault, can be inspected with a speculum.

Information.—The information elicited by indirect inspection is in most part confined to lesions of the mucous membrane, as the position of the patient and the support given to the walls of the vagina by the blades of the speculum often temporarily replace all forms of sacculation or prolapse. Thus, with the patient in Sims's or the knee-chest posture the vagina balloons out and the vaginal walls become more or less tense even in cases in which marked prolapse exists. The same is true when the patient is examined in the dorsal position with a bivalve speculum, because the blades of the instrument are placed parallel with the anterior and posterior vaginal walls, and consequently they obliterate all evidence of a rectocele or cystocele. However, as will be seen later on in discussing the technic, by using a perineal retractor or a depressor for the anterior vaginal wall and by applying the blades of a bivalve speculum in various positions even a sacculation or a prolapse of the vagina can be exposed to view.

We can recognize the following lesions of the vagina by indirect inspection: Inflammations, fistulas, neoplasms, strictures, scar tissue, a rectocele or a cystocele, and the origin of abnormal discharges.

Instruments.—The following instruments are required: (1) Goodell's bivalve speculum; (2) Sims's duck-bill speculum; (3) Simon's speculums (curved and flat blades); (4) a vaginal depressor; (5) long straight dressing forceps; (6) long flexible silver probe (Fig. 205).

Description of the Instruments.—Goodell's Speculum.—This is the best bivalve speculum in use. The blades must not be over three and a half inches long, and the handle must be short and lighter in weight than the blades, otherwise the instrument will slip out of the vagina unless it is constantly held in position. On the other hand, if the proper proportions in weight exist between the handles and the blades, the instrument is practically

self-retaining. A simple method of determining this fact when purchasing the instrument consists in balancing the speculum at the proximal ends of the blades on the index-finger. If the blades are the heaviest part of the instrument, they will naturally dip downward, while the handles will rise. The bivalve speculum is used with the patient in the dorsal position.

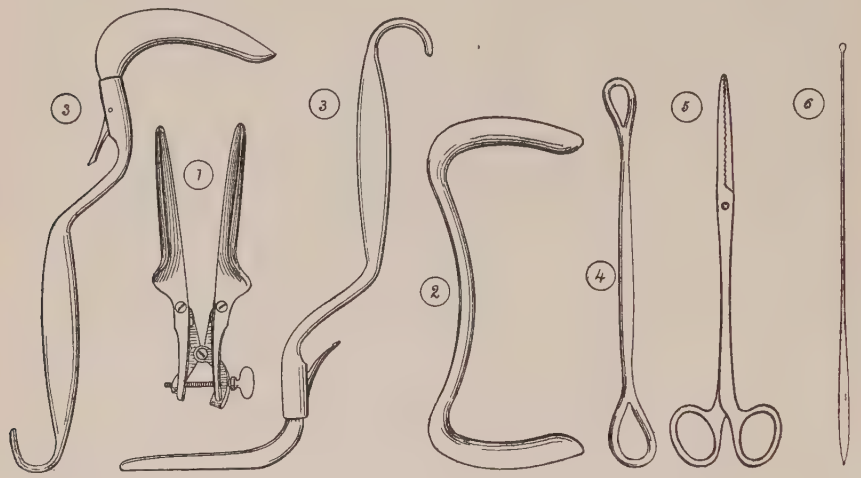


FIG. 205.—INSTRUMENTS FOR INDIRECT INSPECTION OF THE VAGINA (page 227).

Sims's Speculum.—This instrument consists of a handle with a permanently attached duck-bill shaped blade at each end. It is used in the knee-chest or the left lateral-prone position to pull back or retract the perineum and expose the anterior vaginal wall.

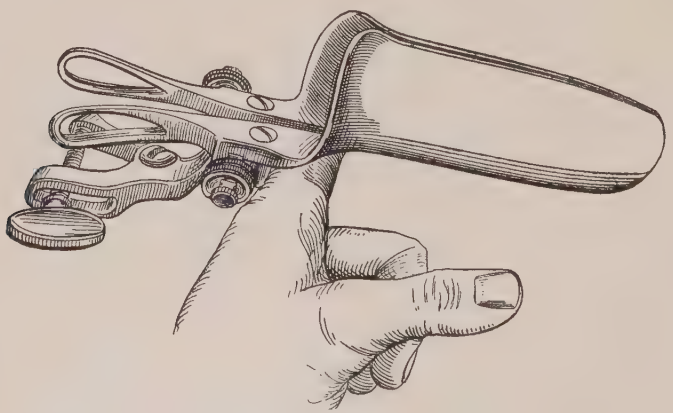


FIG. 206.—TESTING THE WEIGHT OF THE HANDLE OF A GOODELL'S SPECULUM.

Simon's Speculum.—These instruments consist of two handles with adjustable blades of various sizes and shapes, and while one speculum is used to retract the perineum, the other, with a flat blade, can be introduced if necessary to elevate the anterior vaginal wall, thus taking the place of a

vaginal depressor. Simon's speculums are used in the dorsal, left lateral-prone, and knee-chest positions (Fig. 208).

Vaginal Depressor.—This instrument is used in connection with either Sims's or Simon's speculum to elevate the anterior vaginal wall when it is relaxed and sags down, thus obscuring the parts above and rendering inspection difficult or impossible (Fig. 209).

Long Straight Dressing Forceps.—This instrument is used to hold small balls of absorbent cotton which are sometimes required to remove secretions which collect on the vaginal mucous membrane.

Long Flexible Probe.—This instrument is used to probe the vaginal mucosa and explore sinuses or fistulas.

Preparation of the Patient.—Same as for Vaginal Touch.

Position of the Patient.—Three positions are employed in making examinations with the speculum: The dorsal, the left lateral-prone, and the knee-chest postures.

Dorsal Position.—For routine examinations this posture is very satisfactory and is used more frequently than the others. In this position the vaginal canal does not expand or balloon out, and hence a relaxation or a prolapse is readily seen because it is not temporarily obliterated. On the other hand, however, the

Fig. 207.—Sims's Speculum.

upper part of the canal cannot be exposed well in women who are fat or who have relaxed vaginal walls.

Left Lateral-prone Position.—In this posture when the speculum is introduced and the perineum is retracted air rushes in at once and balloons out the vagina, and at the same time the intestines and uterus sink away, leaving the entire vaginal canal exposed to view. Under these circumstances a prolapsed or a relaxed condition of the vaginal walls is temporarily obliterated on account of the expansion of the canal and the traction exerted by the pelvic organs upon it. This position is therefore particularly valuable when a careful inspection of the vaginal mucous membrane is required in cases of inflammation, fistulas, or other pathologic conditions situated in the upper part of the canal. It is also especially advantageous in fat women and in those who have marked relaxation of the walls of the vagina.

Knee-chest Position.—The indications are the same as for the left lateral-prone position. In the knee-chest position, however, the vagina is more fully expanded, and hence a better view is obtained of the canal. For this reason, therefore, it is the best position in which to place the patient when a thorough inspection of the whole vagina is required.

Antisepsis.—Although the subject of antisepsis is discussed fully in the chapter on "The General Technic of Gynecologic Examinations" (see p. 22), I feel that an additional word of caution will not be out of place here, as the examiner cannot be too careful in preventing infection being carried on the instruments from one patient to another. Practically there is only one way to guard against this accident or—if we wish to speak frankly—crime, and that is never to use an instrument a second time without thoroughly cleaning it

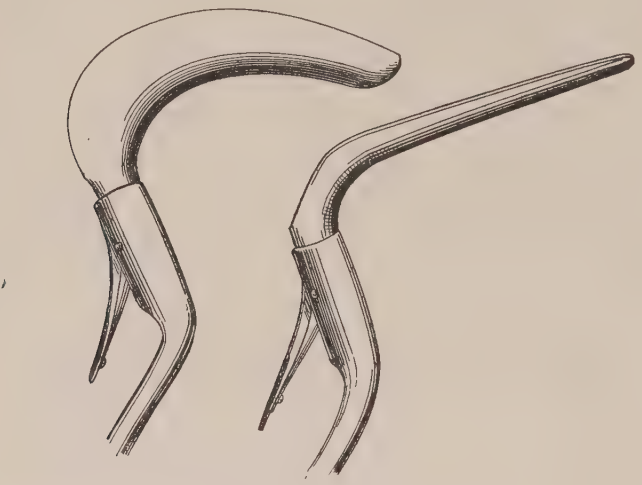


FIG. 208.—SIMON'S SPECULUMS (page 228).

with soap and water and then boiling it in a solution of carbonate of soda (1 per cent.) for five minutes. This will, of course, necessitate having a double set of speculums and other instruments when a number of patients are seen close together, but when we take into consideration the danger of transmitting the infection of syphilis or gonorrhea there certainly ought not to be any hesitancy on that account.

Technic.—Having placed the patient in the proper position, the speculum

FIG. 209.—VAGINAL DEPRESSOR (page 229).

is warmed by dipping it into hot water and the blades are lubricated with liquid soap. The examiner is now ready to introduce the instrument.

Goodell's Bivalve Speculum.—The patient is placed in the dorsal position and the vulvar canal separated by the thumb and the index-finger. The blades of the speculum are closed tightly and then passed between the thumb and the finger directly into the vagina parallel with the lateral walls.

The handles are then turned to the patient's left until the blades become parallel with the anterior and posterior walls of the vagina, when they are spread

apart by pressing the handles together and fixing them in this position by means of the screws.

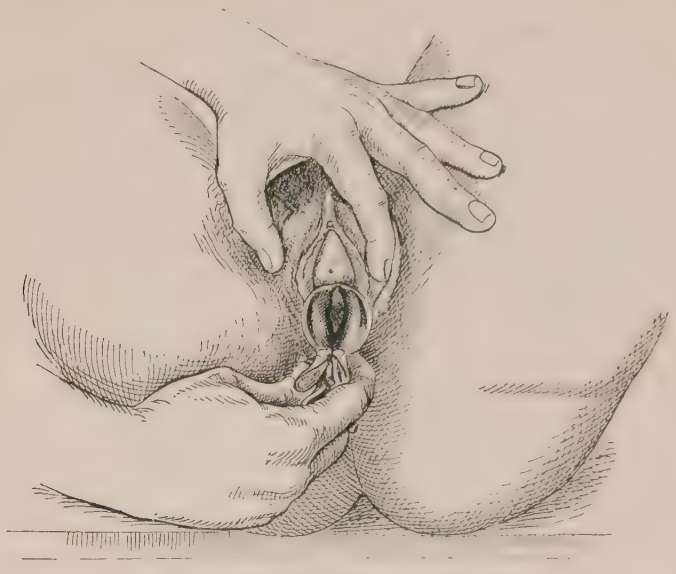


FIG. 210.—INDIRECT INSPECTION OF THE VAGINA.
Showing the introduction of Goodell's speculum.

After inspecting the vagina the screws are loosened and the handles turned back, bringing the blades parallel with the lateral vaginal walls. Again spread-

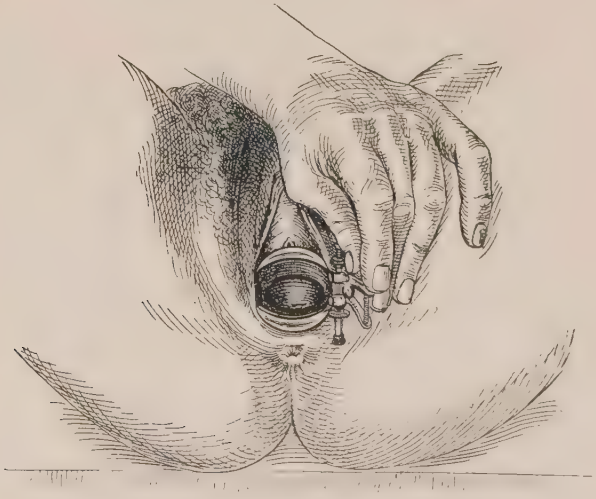


FIG. 211.—INDIRECT INSPECTION OF THE VAGINA.
Exposing the lateral walls of the vagina with Goodell's speculum.

ing the blades apart, the vagina is exposed to view and the anterior and posterior walls can now be thoroughly inspected (Fig. 212).

Sims's Speculum.—The patient is placed in the left lateral-prone or the knee-chest position and the vulvar canal exposed by separating the buttocks.

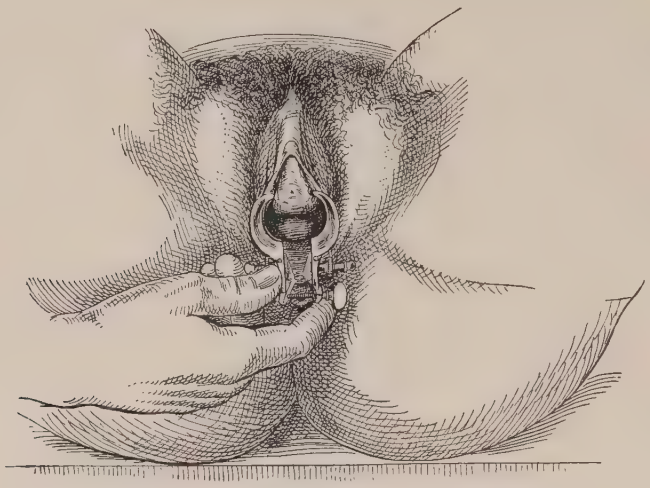


FIG. 212.—INDIRECT INSPECTION OF THE VAGINA (page 231).
Exposing the anterior and posterior walls of the vagina with Goodell's speculum.

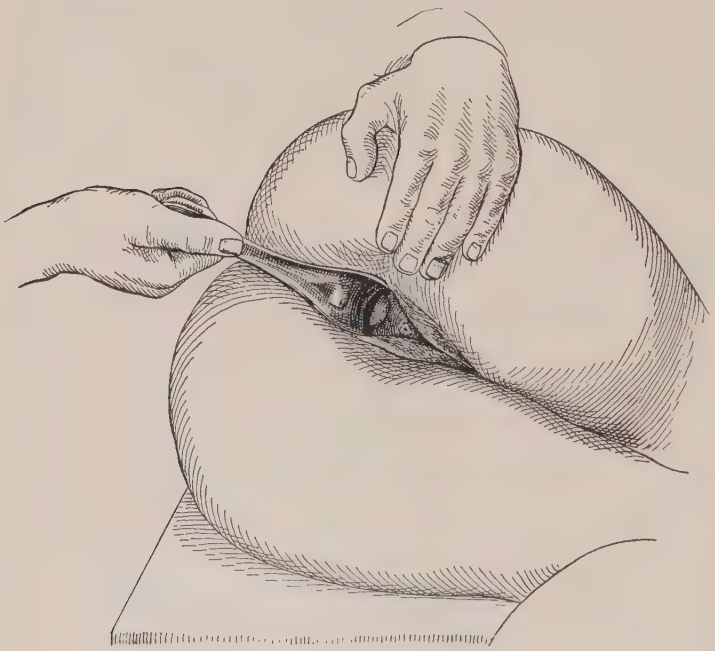


FIG. 213.—INDIRECT INSPECTION OF THE VAGINA.
Introduction of Sims's speculum.

The handle of the speculum is grasped in the right hand and passed directly into the vagina with the convexity of the blades toward the coccyx and the handle of the instrument over the perineum.

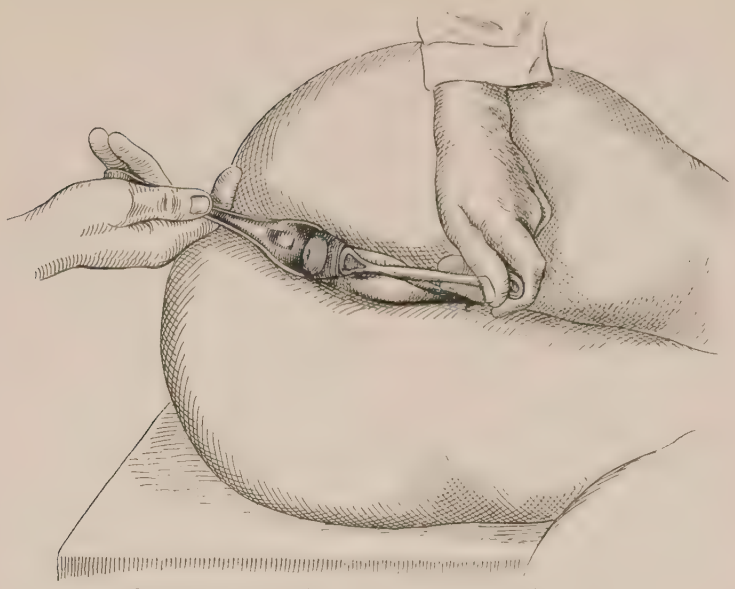


FIG. 214.—INDIRECT INSPECTION OF THE VAGINA (page 234).
The perineum is retracted with Sims's speculum and the anterior wall of the vagina elevated with a vaginal depressor.

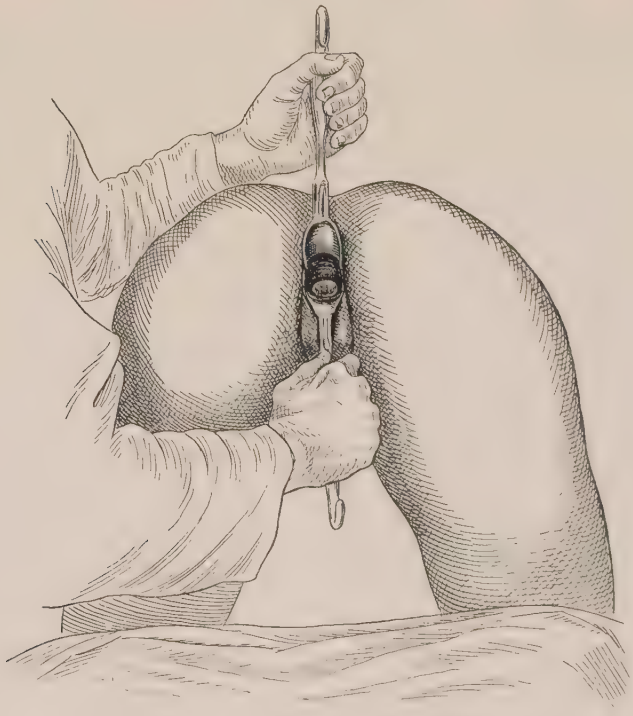


FIG. 215.—INDIRECT INSPECTION OF THE VAGINA (page 234).
Curved and flat blades of Simon's speculums introduced with the patient in the knee-chest position.

The perineum is now retracted and the vaginal canal exposed to view. If the vagina does not expand well and the anterior vaginal wall sags and obstructs the view, the depressor should be used to elevate the relaxed structures (Fig. 214).

Simon's Speculums.—The patient is placed in either the dorsal, the left lateral-prone, or the knee-chest position. The instrument is introduced in the same manner as Sims's duck-bill speculum. For routine examinations in the dorsal position Simon's speculums are very useful, and a good exposure of the entire vaginal canal can usually be obtained by using the flat blade anteriorly to elevate the vaginal wall while the perineum is being retracted. The instrument may also be used with advantage in the left lateral-prone and the knee-chest positions in place of Sims's speculum, and if the patient is correctly placed the whole vaginal canal, including the vault, will be exposed. If there is any tendency to sagging in the anterior vaginal wall, the flat blade can be used to elevate it or the parts can be held out of the way by a vaginal depressor (Fig. 215).

MICROSCOPIC AND BACTERIOLOGIC EXAMINATIONS.

Limitations.—These methods of investigation are limited to the examination of the discharges which are found present in the vagina.

Information.—We can determine the character of the infection in cases of vaginitis and other inflammatory conditions.

Technic.—The methods of collecting and preserving the discharges for a subsequent microscopic or bacteriologic examination are discussed in Chapter II.

MALFORMATIONS.

As in the case of malformations of the uterus, congenital deformities of the vagina are dependent for the most part upon variations in the evolution of the ducts of Müller, and hence vaginal and uterine anomalies frequently coexist, although it is by no means uncommon for one organ alone to be defective in its development.

The following anomalies have been observed:

Persistent cloaca.
Double vagina.
Absence of the vagina.
Stenosis of the vagina.
Blind pouches.

Persistent Cloaca.—This condition may be properly classed with defects of the vagina, since the vagina presents an aperture leading into the rectum, through which the feces are discharged, if, as frequently happens in such cases, the anus is absent. The defect is the persistence to a greater or less degree of that stage of development when the gut and the genito-urinary passages open into a common receptacle—the *cloaca*. The urethra may be practically normal or it may open into the vagina at a higher level than usual. The septum which normally divides the cloaca into the rectum and the urogenital sinus is defective, leaving the aperture of communication between the rectum and the vagina referred to above.

Treatment.—Buckmaster's modification of the ordinary operation for closing the false passage by bringing down the rectum and making a new anus is the best procedure to follow in cases in which no anal opening is present. He makes a new anus immediately in front of the fibers of the levator ani muscle and brings down the end of the rectum and stitches it in that position. At a later period a secondary operation is performed which consists in splitting the fibers of the muscle and making a sphincter.

Double Vagina.—This condition is also known as *septate vagina* and results from the imperfect coalescence of the lower parts of the Müllerian ducts,

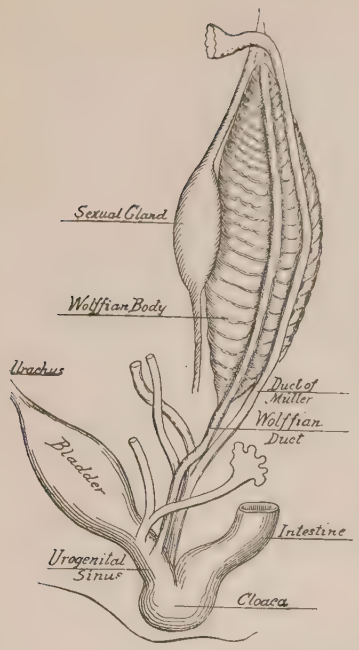


FIG. 216.

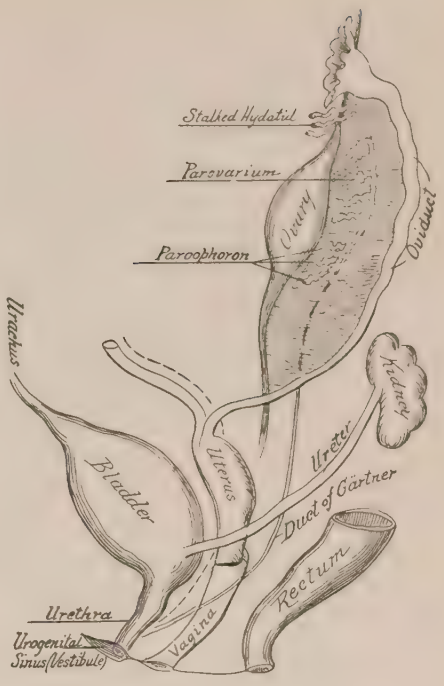


FIG. 217.

DEVELOPMENT OF THE GENITO-URINARY SYSTEM IN THE FEMALE (modified from Heisler).

the septum between the two failing wholly or in part to break down and disappear. The septum occupies the long axis of the vagina at or near the median plane, and it may be complete or incomplete, although it seldom divides the canal into equal halves. If the septum runs from before backward, the vagina is divided laterally; but if it is transverse, the vaginas lie one in front of the other. In very rare cases a double vagina is associated with two uteri and two distinct vulvar openings, but usually, however, the malformation exists alone or in connection with a uterus duplex and a hymen having either one or two apertures.

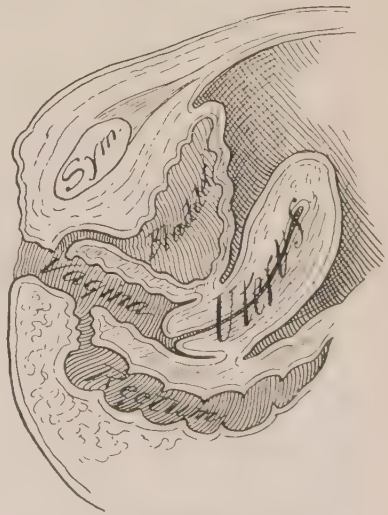


FIG. 218.—PERSISTENT CLOACA.

If a double vagina is associated with a uterus duplex, each vagina and uterus form a distinct sexual apparatus and impregnation can occur on one side independently of the other. If the uterus is single, the cervix opens into one vagina while the other ends in a blind pouch, and sterility is likely to result unless the canal connected

with the uterus is used in sexual intercourse. In cases in which the upper end of the septum is incomplete the cervix communicates with both partitions of the vagina, and impregnation is therefore not interfered with even when sexual intercourse is confined to one side alone. In some instances one or both sides of the vagina are imperforate at their lower ends and the menstrual blood accumulates after puberty, causing a hematocolpos, or the obstruction, if it exists on both sides, renders coitus impossible.

Treatment.—A double vagina is of no clinical importance unless it prevents the escape of uterine or vaginal discharges, interferes with coitus or impregnation, or obstructs the passage of the child during labor.

Atresia of the vulvar end of a double vagina is relieved by a crucial incision and drainage, as in the case of an imperforate hymen. If the septum should interfere with coitus or impregnation or obstruct childbirth, it must be divided along its entire course with scissors and the vaginal canal kept constantly packed with sterile gauze until healing takes place to prevent reunion.

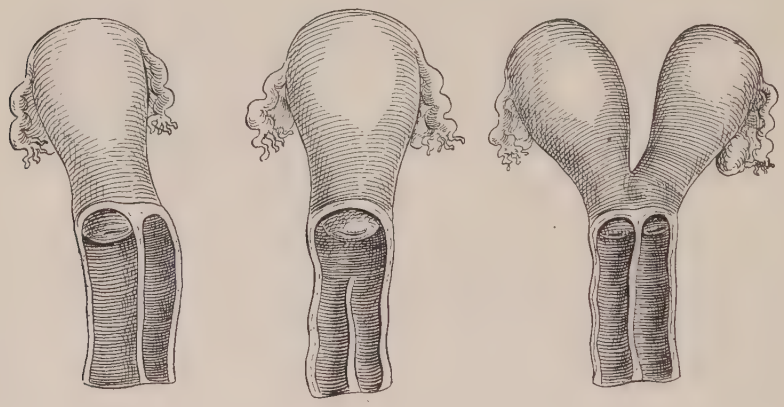


FIG. 219. FIG. 220. FIG. 221.

MALFORMATIONS OF THE VAGINA.

Fig. 219, Complete double vagina with a single uterus; Fig. 220, incomplete double vagina; Fig. 221, double vagina with two uteri.

Absence of the Vagina.—The vagina may be absent throughout its entire length or only in part. The defect is due to lack of canalization of the lower parts of the ducts of Müller, these tubes remaining solid epithelial cords instead of becoming hollowed out to form true canals. The malformation usually coexists with absence or ill development of the other internal sexual organs—the tubes, the uterus, and the ovaries—or these organs may be normally formed and functionally active. In rare instances the anomaly may be associated with absence of the vulva and an uninterrupted skin surface may cover the entire vulvar region.

Results.—Up to the period of puberty an imperforate vagina is without clinical significance, but after menstruation becomes established the vaginal atresia prevents the escape of the menstrual fluid and the uterus and the Fallopian tubes become distended (*hematometra* and *hematosalpinx*); if the vagina is only partially lacking, there is also dilatation of the patulous portion of the canal (*hematocolpos*). If the uterus and tubes are not functionally active, the malformation may not be discovered until the woman marries and finds that intercourse cannot be accomplished.

Symptoms.—As in the case of imperforate hymen, the malformation may not be discovered until puberty, when symptoms of obstruction manifest themselves, if the uterus and the ovaries are not defective. The physical and psychic phenomena of adolescence become established and the absence of the menstrual flow calls attention to the possible presence of some form of anomaly affecting the genital organs. An examination then reveals the presence of an imperforate vagina and a fluctuating tumor situated immediately above the symphysis pubis and extending downward into the pelvic cavity. This tumor, if carefully observed, is found to increase in size at each menstrual epoch and to become gradually smaller again during the intermenstrual periods.

Diagnosis.—The diagnosis is based upon the history, the symptoms, and the physical examination. The latter reveals the presence and extent of the atresia and the tumor caused by the retained menstrual blood.

Prognosis.—In cases in which defective development of the uterus and the ovaries is present, as indicated by the absence of a menstrual molimen, nothing whatever should be done to relieve the condition except perhaps the doubtful expedient of making an artificial vagina for the purpose of sexual intercourse. If, however, the uterus and its adnexa are functionally active, there is danger of tubal rupture or sepsis occurring unless an outlet is made for the escape of the pent-up menstrual blood.

Treatment.—The treatment consists of the following procedures:

Making an artificial vagina.

Hysterectomy.

Making an Artificial Vagina.—If the vagina and ovaries are functionally active, the indication is clearly to make an artificial vagina or a small opening through which the menstrual blood can escape; but if these organs are absent or defective in development, it is best to let the malformation alone, as the tendency to contraction would eventually make such an opening useless for sexual intercourse.

Operation.—The patient is placed in the dorsal position and a sound introduced in the bladder, to act as a guide along with the index-finger of the left hand in the rectum. An incision is then made transversely through the skin over that part of the vulvar canal which would normally be occupied by the outlet of the vagina, and using the fingers, a dry dissector, or a blunt-pointed pair of scissors, the surgeon gradually works his way upward until the uterus or the blood-sac is reached. The artificial opening is then enlarged with the fingers or the blades of a heavy pair of forceps and the retained blood evacuated by irrigation, as described in cases of imperforate hymen. Skin-flaps are then taken from the nymphæ and the perineum to cover the surfaces of the opening and form a new vagina. If this is impracticable, a glass plug is used to keep the parts separated during the healing process and subsequently to prevent the opening from closing by contraction.

Hysterectomy.—Removal of the uterus by the *abdominal route* without the ovaries is indicated in cases in which an artificial vagina cannot be kept sufficiently patulous to drain the menstrual blood completely and prevent the fluid from reaccumulating.

Stenosis of the Vagina.—Abnormal narrowness of the vagina, especially if associated with a unicornate or asymmetrically developed bicornate uterus, may be due to an arrested development of the lower end of one Müllerian duct, and under these circumstances the canal is not only contracted along its entire length, but is also generally situated to one side of the median line. Stenosis of the vagina may also be caused by the presence of one or more perforated septums or solid membranes which are stretched across the canal and obstruct its lumen.

The partitions are either due to incomplete canalization of the Müllerian ducts or to the coalescence of opposing surfaces during fetal life.

Treatment.—A generally contracted vagina is of no clinical importance

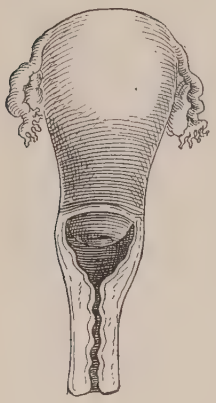


FIG. 222.

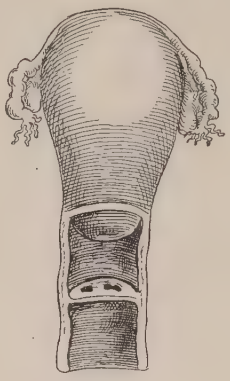


FIG. 223.

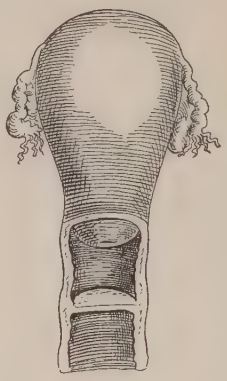


FIG. 224.

MALFORMATIONS OF THE VAGINA (page 237).

Fig. 222, Contraction of the vagina; Fig. 223, perforated septum of the vagina; Fig. 224, solid membrane occluding the vagina.

unless it is small enough to interfere with sexual intercourse, in which case forcible dilatation should be performed under an anesthetic and the canal sufficiently stretched to permit easy penetration of the penis.

Membranous septums are treated by excision and stitching the raw edges together with interrupted catgut sutures, or they are freely divided by a crucial incision and the parts kept separated with a gauze tampon until the healing process is completed.

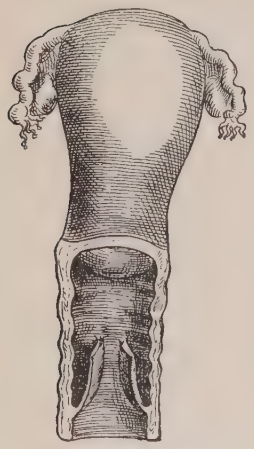


FIG. 225.—MALFORMATION OF THE VAGINA.
Showing blind pouches in the lower part of the vagina.

Blind Pouches.—Sometimes blind pouches or canals, due probably to overdeveloped lacunæ, are found just within the vaginal entrance upon the lateral walls of the vagina. These abnormal pockets in the walls of the vagina may be considerably over an inch long and three-quarters of an inch in diameter. They cause no trouble whatever unless they become the seat of an infection, in which case the micro-organisms are difficult to destroy, and it is therefore often necessary to split open the canals before the disease can be eradicated.

WOUNDS OF THE VAGINA.

Causes.—The situation of the vagina protects it largely from external violence, but it is, however, often the seat of traumatic lesions due to labor or sexual intercourse. Vaginal injuries vary in importance from a simple contusion to a large open wound involving the surrounding organs. Thus, a tear may extend through the vaginal vault into the peritoneum or up into the base of the broad ligaments; it may also injure the ureters or bladder; and, finally, it may involve the rectum.

The causes of these injuries are conveniently discussed under three headings, as follows: (1) Labor; (2) coitus; (3) external violence.

Labor.—This is the most frequent cause. Injuries during labor are due to the passage of the child through the birth-canal and to careless or improper use of the hands or instruments in performing the various obstetric operations or manipulations. Lacerations are apt to occur in rapid deliveries, in old primiparæ, or in cases of obstruction due to an impacted head. Under the latter conditions the tissues become bruised as the result of pressure, and eventually slough, causing fistulous openings between the vagina and the bladder or the rectum. Extensive tears of the vagina may be caused by spontaneous rupture of the uterus, and in some cases the connective tissue of the vaginal walls may be injured without tearing the mucous membrane and a thrombus or hematoma results, as in other parts of the body. The obstetric forceps often causes serious injuries through carelessness or ignorance upon the part of the operator, and one of the blades may be pushed through the vaginal vault into the peritoneal cavity, or other parts of the vagina may be badly cut or torn during the application of the instrument or when traction is made upon the head, especially during an attempt to rotate the occiput anteriorly. The introduction of the hand into the vagina to turn the child by podalic version and the extraction of the bones of the fetal head after craniotomy have frequently caused more or less extensive lacerations. When the vagina is the seat of cancerous infiltration, its dilatability is impaired and tears occur as the head is forced through the birth-canal.

Coitus.—This cause is comparatively rare. Rape upon children or young girls frequently produces extensive laceration on account of the disproportion in size between the genital organs and the tender or undeveloped condition of the tissues. Intercourse with old women is another cause, owing to the fact that the parts have lost their dilatability and have become more or less contracted. It sometimes happens that lacerations of the hymen occurring at the first sexual intercourse may extend into the vagina. A great disproportion in size between the male and female organs may cause extensive tears, especially when brutal violence is used during the act. Operations which result in shortening or narrowing of the vagina are a predisposing cause, and, finally, the same is true of all forms of congenital anomalies, such as stenosis, atresia, double vagina, and infantile conditions or lack of development.

External Violence.—Injuries from this cause, as previously mentioned, are rare. The vagina may be penetrated by falling on a sharp object, by splinters of wood while sliding down an inclined board, and by the horn of an animal. These causes produce extensive and dangerous wounds. Injuries are also caused by the introduction of foreign bodies into the vagina by the patient herself, and the vaginal walls may be lacerated by the hand or an instrument during a gynecologic operation. And, finally, a brutal husband may inflict a dangerous injury, as in a case reported by Mann, where there was a "serious laceration of the left side of the vagina, made by the fist of the husband, which was forcibly introduced into it in a fit of passion."

Symptoms.—Naturally the character and severity of the symptoms depend upon the situation and extent of the injury. A slight tear in the mucous membrane will give rise to no local or constitutional disturbances, whereas an extensive wound or one involving adjacent organs will result in marked symptoms. It must also be borne in mind that the symptoms of a vaginal injury caused by labor are always more or less modified or masked by the overstretching of the tissues from the passage of the child through the birth-canal and by the presence of the normal discharges. Thus the nerve-endings are blunted and pain is absent, while a slight hemorrhage may be readily overlooked. In non-puerperal

injuries, however, the symptoms are apparent and can only be attributed to the traumatism.

Local Symptoms.—These are: (1) Pain; (2) hemorrhage; (3) impaired function; (4) retraction of the edges of the wound.

Pain.—This symptom is more or less constant. If the injury occurs during labor, it is impossible to distinguish the pain produced by the traumatism from that caused by dilatation of the parts during the second stage of labor. As a rule, in non-puerperal injuries the pain is sharp and acute in the beginning, and it soon disappears entirely unless complications arise in the wound.

Hemorrhage.—The bleeding, as a rule, is not severe unless the vagina is the seat of varicose veins, or the injury involves the structures of the vulva. The hemorrhage in puerperal injuries is generally masked by the normal discharges.

Impaired Function.—As in other parts of the body, the functions of the vagina are more or less modified. Thus a puerperal tear may extend into the peritoneum and some of the lochial discharge may escape into the general abdominal cavity instead of by the normal channel, and in a non-puerperal laceration sexual intercourse may be prevented by the tenderness of the parts.

Retraction of the Edges of the Wound.—The situation of the vagina and the pressure which is normally exerted upon its walls prevent to a greater or less extent the gaping which usually takes place in the edges of a wound in other parts of the body. There is, therefore, but little or no separation of the margins unless the wound is very extensive and irregular or the intestines have descended through it into the vaginal canal. Transverse wounds are apt to gape on account of the lateral pressure on the vaginal walls.

Constitutional Symptoms.—These are: (*a*) Shock (see Injuries of the Vulva, p. 166); (*b*) fat embolism (see Injuries of the Vulva, p. 166).

Results and Prognosis.—Injuries of the vagina are liable to result in septic infection if the peritoneal cavity or the base of the broad ligaments is involved and the tears are extensive or irregular. A wound communicating with the peritoneum may result in a temporary prolapse of the intestines or a permanent hernia. Intestinal prolapse increases the danger of general peritonitis, and if the accident is unrecognized a knuckle of intestine may become adherent to the wound and, subsequently becoming gangrenous, form an ileovaginal fistula. Finally, the vaginal canal may be narrowed and distorted by cicatricial tissue or permanent fistulous openings may form between it and the bladder or rectum.

Treatment.—The treatment is considered under the following headings: (1) Hemorrhage; (2) shock; (3) cleansing the vagina; (4) coaptation of the edges of the wound; (5) dressings; (6) rest; (7) general treatment.

It is important to examine the vagina carefully in all cases of injury, otherwise fatal mistakes will be made as to the extent and character of the traumatism. The entire canal may be readily explored and the subsequent treatment carried out by placing the patient in the dorsal posture and introducing a perineal retractor or some other form of speculum. In puerperal lacerations a gauze tampon should be placed against the cervix to keep back the uterine discharges while the examination is being made and when the daily dressings are applied.

Hemorrhage.—All spurting vessels are tied with catgut and the oozing is controlled when the edges of the wound are brought together or when the vagina is dressed with gauze packing. Styptic agents should not be employed, as they interfere with repair and increase the dangers of sepsis.

Shock.—(See Shock, p. 859.)

Cleansing the Vagina.—First remove all foreign material and blood-clots with dressing forceps and small gauze sponges. The injury is then carefully examined to determine its character and extent, as it is important to know whether the laceration is limited to the vaginal walls or whether it extends into the peritoneal cavity or involves adjacent organs. If the vagina alone is involved, a douche of hot normal salt solution is given and the parts dried with a gauze sponge. The wound is again examined and all irregular margins and devitalized tissues removed with scissors. The vagina is irrigated with a hot solution of corrosive sublimate (1 to 1000), followed by the salt solution, and dried.

When the wound communicates with the peritoneum a douche must not be given, because the fluid may gain entrance into the general peritoneal cavity and cause septic infection. Under these circumstances, after removing the irregular margins of the wound and the devitalized tissues, the vagina is cleansed by sponging it thoroughly with hot normal salt solution; the sublimate solution must never be used for this purpose.

Coaptation of the Edges of the Wound.—The management of the wound depends upon its character and extent. Clear-cut incised wounds involving the vagina alone or communicating with the bladder or rectum are carefully closed with interrupted catgut or silkworm gut sutures, while lacerated or contused injuries are allowed to heal by granulation. When the wound communicates with the peritoneum, it should be kept open, otherwise if infection takes place there is no way to drain the pelvic cavity except by removing the sutures. Furthermore, free drainage from the start in these cases lessens the danger of sepsis.

Dressings.—Sutured, lacerated, and contused wounds are dressed with gauze. The packing should be firm during the first twenty-four hours to control the oozing, and if necessary a compress and T-bandage should be applied. After this time the gauze should be loosely packed and the T-bandage will not be needed. The tampon is removed daily and the vagina irrigated with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and dried; fresh dressings are then reintroduced.

If the wound communicates with the peritoneal cavity, it is packed with a strip of gauze, which is allowed to remain undisturbed for three days and then gently removed after exposing the parts with a speculum. The vagina is then cleaned by sponging with hot salt solution, carefully dried, and the packing replaced. Fresh dressings are then applied every day until the wound closes and at the end of the first week a douche of normal salt solution may be substituted for sponging.

Rest.—In wounds involving the peritoneum, the bladder, and the rectum rest in bed with the use of the bed-pan is essential. The surgical principles underlying rest in the treatment of wounds must not be lost sight of in the care of these injuries. The patient should remain in bed for one week after the sutures are removed in rectal or bladder wounds, and in those communicating with the peritoneal cavity she should not be allowed to assume the erect posture until the injury is entirely healed. The length of time the patient should remain in the recumbent posture in wounds involving the vaginal walls alone depends upon the extent and character of the injury.

General Treatment.—The general treatment is carried out upon the same principles as already laid down under injuries of the vulva on page 167. In wounds, however, involving the bladder or rectum the treatment differs somewhat, and is similar to the after-care of operations for the relief of vesicovaginal and rectovaginal fistulas (see pp. 762 and 771).

DISEASES OF THE VAGINA.

ACQUIRED STENOSIS AND ATRESIA.

Acquired obstructions may occur at any part of the vagina or they may involve the entire canal.

Causes.—Lacerations.—Lacerations are a frequent cause and are due to traumatisms occurring in labor or injuries produced by foreign bodies. Under these conditions cicatrices result and the vagina contracts or the canal may be narrowed by direct union between apposing raw surfaces.

Ulcerations.—The vitality of the vaginal tissues may be destroyed and ulceration result from a prolonged labor or the pressure of a foreign body, and from caustic or acid applications. In some cases extensive sloughing may occur during the course of an attack of syphilis, diphtheria, smallpox, scarlet fever, or typhus, and the lumen of the vaginal canal may be seriously contracted.

Inflammation.—Adhesions may occur as the result of an adhesive inflammation and narrow the vaginal canal.

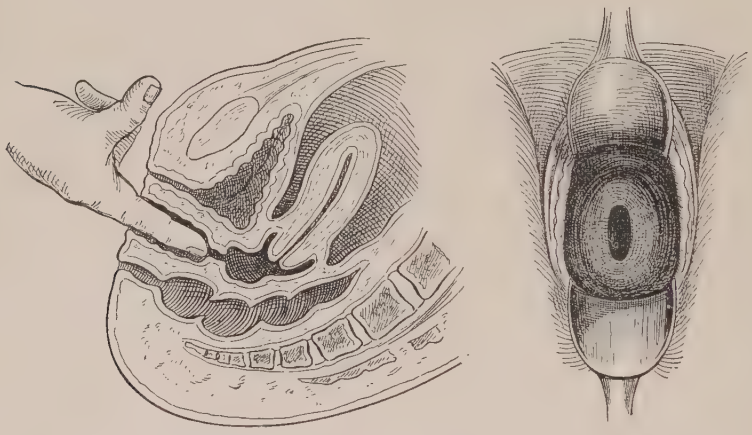


FIG. 226. FIG. 227.

DIAGNOSIS OF ACQUIRED STENOSIS OF THE VAGINA.

Fig. 226 shows tip of finger in contact with the obstruction; Fig. 227 shows the obstruction seen through Simon's speculums.

Operations.—A faulty operative technic may narrow the vagina and result in a stricture.

Symptoms.—The symptoms are due to mechanic interference with the functions of the vagina and to various nervous reflexes. When stenosis or partial obstruction exists, there is no interference with the escape of the vaginal discharges or the menstrual blood; but if there is atresia or complete occlusion, retention results, giving rise to characteristic symptoms. (See Imperforate Hymen, p. 161.) The effect of vaginal strictures upon the act of copulation depends upon the situation and character of the cicatrices and adhesions. If the obstruction is situated in the upper portion of the vagina and the tissues are not tender, sexual intercourse may take place; but if the parts are painful to the touch or the stenosis is located in the lower end of the canal, penetration by the male organ is difficult or impossible.

Local and reflex pains are often present and are caused by compression of the nerve-endings in the scar tissue. In some cases the reflexes are felt in adjacent

organs, while in others the patient complains of pain under the left mammary gland and in the epigastric region.

Diagnosis.—The patient is placed in the dorsal posture and the vagina examined by touch and sight. If the lesions are high up, they are readily felt with the finger or seen through the speculum. When it is impossible to introduce a speculum, on account of the occlusion being near the vaginal entrance, the examiner must rely entirely upon the sense of touch.

It sometimes happens that adhesions or cicatrices situated low down in the vaginal canal conceal others which are located higher up, and it is therefore impossible to discover them until the lower ones are removed.

As a rule, an anesthetic should be administered before making the examination.

Differential Diagnosis.—Stenosis or atresia of the vagina must be distinguished from congenital malformations, adhesive vulvitis, and vaginismus.

Prognosis.—The prognosis depends upon the situation and character of the lesion. When it is situated in the upper part of the vagina, sexual intercourse is not seriously interfered with, even if the cicatrices cannot be removed; but when the abnormal condition occupies the lower two-thirds of the canal, the prognosis is entirely changed, and under these circumstances copulation is impossible if the adhesions are extensive and contract the vagina, unless the canal can be sufficiently enlarged to admit the penis without causing the woman pain. The prognosis of atresia is always favorable so far as the escape of vaginal discharges and menstrual blood is concerned, as it is an easy matter to make a permanent opening large enough to drain the canal.

The effect of pregnancy upon vaginal cicatrices is to soften them, so that when labor occurs they are dilatable and cause little or no trouble unless the constriction is marked and involves an extensive area.

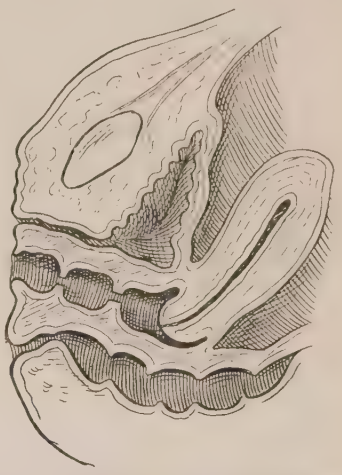


FIG. 228.—DIAGNOSIS OF ACQUIRED STENOSIS OF THE VAGINA.

Showing an obstruction in the lower part of the vagina concealing a stenosis higher up.

Treatment.—The patient is anesthetized and placed in the dorsal position. While the operative technic necessarily depends upon the character of the obstruction in each case, there are, however, certain rules which have a general application.

1. Guard against injuring adjacent organs by introducing the index-finger into the rectum and a sound into the bladder before removing the obstruction.

2. In separating adhesions use a dry dissector or the fingers as much as possible.

3. Unite the margins of all raw surfaces whenever feasible.

4. Always use interrupted sutures and introduce them in the long axis of the vagina, as the canal will be constricted if the wound is brought together transversely.

Bands of adhesion are cut off close to the vaginal wall and the edges of the raw surfaces are united with sutures. Imbedded scar tissue is dissected out and the wound closed. When it is impossible to remove all the cicatricial tissue, multiple parallel incisions are made into and around it and the vagina slowly

stretched with hard-rubber dilators until its caliber is normal. A glass plug (see p. 224) is then inserted into the vagina and kept in position by a T-bandage until the incisions are entirely healed. During this time the patient must remain in bed, and subsequently the plug should be worn for two or three hours daily for an indefinite period to prevent the recurrence of the constrictions. In simple cases a few weeks or months are all that are necessary, but when the cicatrices have involved a large area it may be necessary to use the plug for years.

In cases where the adhesions and cicatrices are very extensive it is not always advisable to complete the dilatation of the vagina at one operation, on account of causing too much traumatism. Parallel incisions are made at each operation over a limited portion of the vagina and the canal packed with gauze. The packing is renewed daily, and after the final operation is performed the glass plug is employed as described above. The great advantage gained by repeated operations in these cases, apart from guarding against serious traumatism, is the softening effect of pressure upon the cicatrices and adhesions which is exerted by the gauze packing.

The operative technic for complete occlusion or stenosis of the vagina is the same as in the congenital variety (see p. 237).

FOREIGN BODIES.

Causes.—Foreign bodies are frequently found in the vagina. They may be placed there by the patient herself to prevent conception, to produce abortion, for purposes of masturbation, and as a hiding-place for stolen or smuggled articles. The original intention upon the part of the woman is to remove the object, but as it is often forgotten or she is unable to withdraw it, its presence may not be noticed until symptoms of irritation arise. When an object is used for purposes of masturbation, it frequently slips into the vagina and passes beyond the reach of the woman's fingers, and she is unable to remove it. Sometimes foreign bodies ulcerate their way through from the rectum or bladder and are found in the vagina. The close relationship existing between the vulvovaginal orifice and the anus predisposes to the entrance of intestinal worms into the genital canal. Various kinds of parasitic insects have also been found, especially in women who are uncleanly in their habits. It sometimes happens that an object used for a therapeutic or operative purpose is forgotten and becomes a foreign body. This is particularly true of non-absorbable sutures, tampons, pessaries, etc., and cases have been recorded of instruments and sponges, left by mistake in the abdominal cavity at the time of an operation, ulcerating their way into the vagina. In rare instances women have fallen on a pointed object a portion of which has broken off after penetrating the vagina and remains as a foreign body. Finally, an ectopic gestation sac or a dermoid cyst may rupture spontaneously and its contents lodge in the vaginal canal.

Symptoms.—The local conditions depend upon the size, shape, and character of the foreign body. If it does not produce pressure or become infected, its presence may cause no inconvenience and produce no local symptoms. Usually, however, the patient complains of a profuse, foul-smelling, serosanguineous discharge, pelvic pains, and backache, and uterine hemorrhages due to septic endometritis are not an uncommon symptom in cases of long standing. Sexual intercourse is not only painful to the woman, but the foreign body may also irritate the male organ. A non-absorbable suture, such as silver wire or silkworm-gut, which was overlooked when the stitches were removed after an operation is often not noticed until the husband complains of irritation at the time of sexual intercourse.

Results.—The urethra may become infected in time from the purulent discharges and an acute urethritis result. The pressure exerted upon the tissues by a foreign body causes ulceration which forms false passages between the vagina and adjacent organs and endangers the life of the patient from peritonitis or a pelvic abscess. Furthermore, vaginal adhesions and contractions are liable to occur, and in some cases almost completely close the canal. Sometimes a foreign body is more or less completely buried or encapsulated in the vaginal wall by ulcerating below the surface, and eventually becoming covered over by granulation tissue.

The length of time a foreign body may remain in the vagina without producing symptoms depends upon its character and size. Thus, a pessary made of metal or hard-rubber or an article composed of polished glass or ivory will cause little or no trouble for an indefinite period, whereas a rough or an absorbent object quickly becomes infected by the secretions. Large and irregularly shaped objects almost immediately cause ulceration from pressure, and in some instances a foreign body may become covered with a calcareous deposit which changes its shape and causes irritation from the ragged nature of its surface.

Diagnosis.—The diagnosis depends upon the recognition of the foreign object by *touch* and *sight*. The patient is placed in the dorsal posture and the examination made with the index-finger, or Simon's speculums are introduced and the vagina explored by sight. These methods of exploration are positive in their results only when the foreign object is not hidden by contractions, adhesions, or granulation tissue. Under these conditions *vaginal* and *rectal touch* must be combined if the object is situated in the posterior wall of the vagina, and if it is in the anterior wall counter-pressure must be made by *abdominal palpation* above the symphysis pubis or with the sound introduced into the bladder. When the object is buried in the vault of the vagina, its presence is discovered by combined *vaginal* and *abdominal touch*, and it may be necessary in some instances to separate the adhesions or to remove the contractions in the vaginal canal before it is possible to make the diagnosis.

Treatment.—The indications are to remove the foreign body and treat the conditions caused by its presence.

The necessity for the administration of an anesthetic depends upon the character of the case. It should always be employed to facilitate the operation, to save the patient pain, and to lessen the danger of injuring the tissues when there is the slightest difficulty in removing the object. For example, a large body or one with sharp edges requires the greatest amount of care in its extraction to prevent the mucous membrane of the vagina from being lacerated, and hence a general anesthetic is indicated.

The patient is placed in the dorsal posture and the vagina irrigated with a solution of corrosive sublimate (1 to 1000). Simon's speculums are then introduced and the best method of procedure considered.

Vaginal irrigation through the speculum is an efficient means to remove small objects, intestinal worms, and parasitic insects. An ordinary pair of dressing forceps is all that will be needed to extract articles which are free and not too large. Small pieces of broken glass should be picked out separately with tissue forceps, and large objects should be reduced in size by crushing or cutting and the vagina protected with lateral retractors if their edges are sharp or uneven. Constrictions and adhesions are removed with a knife or scissors and free incisions are made into the vaginal wall when the object is buried or encapsulated.

In simple cases after the foreign body has been removed the vagina should be irrigated daily for one week with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution. If, however, serious lesions remain in the

vaginal canal or involve adjacent organs, they are treated upon the principles laid down under Injuries of the Vagina (see p. 240), and sometimes an abdominal section may be required for the relief of a coexisting peritonitis or a pelvic abscess. And, finally, if the urethra or the endometrium has been infected by the purulent discharges, the resulting inflammation will demand our attention and should be treated in the manner described elsewhere (see pp. 594 and 436).

CYSTOCELE.

Synonyms.—Prolapse of the bladder; Prolapse of the anterior wall of the vagina; Vesicovaginal hernia.

Definition.—A prolapse of the anterior wall of the vagina accompanied by a downward dislocation of the posterior wall of the bladder.

Causes.—The causes are classified as follows:

Lacerations of the perineum and pelvic floor.
General relaxation of the structures of the pelvis from disease or frequently repeated labors.
Subinvolution of the vagina following labor.
Tears of the anterior vaginal wall during delivery.
Prolapse of the uterus.

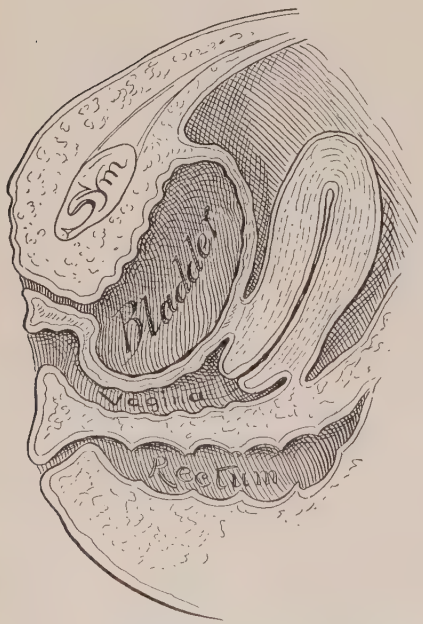


Fig. 229.—Sectional View of a Cystocele.

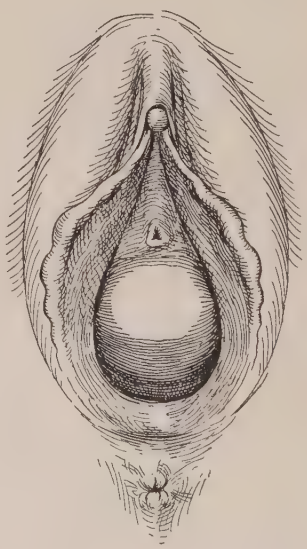


Fig. 230.—Front View of a Cystocele.

Lacerations of the perineum and pelvic floor are the chief causes of the affection. The supporting power of the tissues of the pelvic outlet being destroyed, the vaginal walls eventually prolapse, and as the posterior wall of the bladder is closely and firmly connected with the vagina, it also becomes displaced downward. Cystocele is also observed in women whose pelvic structures have been overstretched by the delivery of a large child or by frequently repeated labors. In

very rare instances prolapse of the vaginal walls may occur in women who have not borne children and in young girls as the result of a sudden or violent muscular effort. Subinvolution of the vagina following labor or miscarriage may also be the cause of a vesicovaginal hernia; and, finally, the affection may accompany a general relaxed condition in women who have lost flesh as the result of a chronic disease. It should be borne in mind that cystocele always accompanies complete prolapse of the uterus.

Frequency.—The affection is very frequent in working women. In the higher classes, however, it is less often observed, because these women receive better obstetric attention, as a rule, and are able to remain quiet until the processes of involution are completed. As the vast majority of cystoceles are caused by a ruptured perineum, it naturally follows that they may be prevented by prompt repair of the traumatism; and hence when the condition occurs in a well-to-do woman, it shows, generally, that the attending obstetrician was either careless and neglectful or else ignorant of the subsequent results of the injury.

Fig. 231.—Sectional View of a Cystocele Showing the Residual Urine (page 248).

Symptoms.—The symptoms depend upon the extent of the prolapse. There is always a slight bulging of the anterior wall of the vagina in women who have borne children, but these cases present no symptoms whatever, and it is only when the dislocation becomes marked that the patient is conscious of any local trouble.

The chief symptoms are:

A sensation of distention at the vulvovaginal orifice.

A sensation of weight and dragging in the pelvic cavity.

Loss of power in urination.

Sensation of Distention at the Vulvovaginal Orifice.—The feeling of distention is due to the prolapsed and bulging vaginal wall and bladder, and is felt only when the patient strains or assumes the erect posture. Under these circumstances the intra-abdominal pressure acts upon the pelvic organs and forces the cystocele downward. The tumor is sometimes mistaken for a prolapsed uterus by the patient, and in describing her symptoms she states that "the womb is down."

Sensation of Weight and Dragging in the Pelvic Cavity.—It is only in large cystoceles and those accompanied by more or less prolapse of the uterus that a sensation of weight or pressure is felt in the pelvic cavity. The symptom is usually due more to the general dislocation of the pelvic organs than to

FIG. 232.

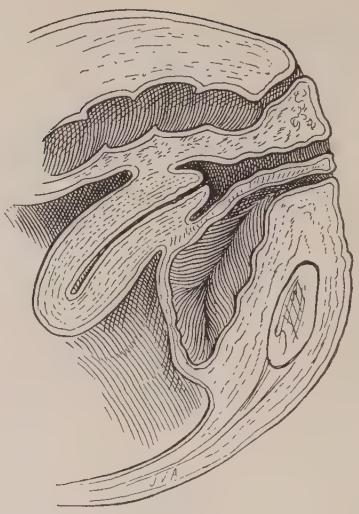


FIG. 233.

CYSTOCELE.

Fig. 232 shows obliteration of the sacculation with the index-finger; Fig. 233 shows disappearance of the cystocele in the knee-chest position.

the sagging of the anterior wall of the vagina alone, and it is naturally absent when the abdominal pressure is removed when the patient lies down.

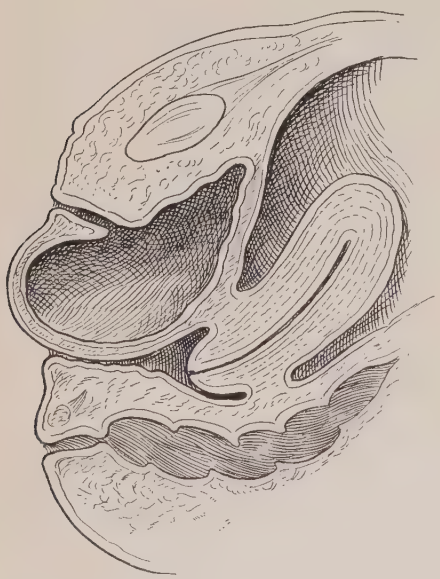


FIG. 234.—DIAGNOSIS OF A CYSTOCELE.
Sectional view, showing the cystocele bulging beyond the vaginal orifice when the patient strains.

Loss of Power in Urination.—The patient complains of more or less difficulty in urinating and a want of power to empty the bladder completely. The extraordinary effort required to void the urine is due to the fact that the abdominal pressure cannot act directly upon the bladder on account of the dislocation of the organ, and the deficiency must therefore be overcome by violent straining. When the cystocele is large, a portion of the bladder is situated below the vesico-urethral junction, and consequently there is always a considerable quantity of urine remaining after the act of urination is supposed to be completed (Fig. 231).

The presence of residual urine may cause vesical irritation and frequent urination, and the patient soon learns to assist herself in emptying the bladder by pushing the anterior vaginal wall up with the fingers or assuming the knee-chest posture during the act of micturition.

Diagnosis.—The physical signs of a cystocele are characteristic and the diagnosis is not difficult. When the patient lies upon her back, there is usually

but little evidence of a tumor; but when she strains, the prolapsed anterior wall of the vagina bulges and presents itself at the orifice as a round elastic mass which disappears on pressure or after the patient ceases to bear down. If the bladder is full of urine, the cystocele is very tense and there is a distinct sensation of fluctuation imparted to the examining finger.

The positive test in the diagnosis is to introduce a curved sound into the bladder and turn its point downward into the most prominent part of the swelling, where it may be readily felt by the examining finger through the intervening walls of the vagina. Again, if the tip of the sound is pushed firmly against the wall of the bladder it will distend the vagina and a projection can be distinctly seen at that point (Figs. 235 and 236).

Another method of diagnosis is to fill the bladder with sterile water and then withdraw it and note the changes in the character of the enlargement. When the bladder is distended, the swelling is tense, smooth, and elastic, but when it is empty, the prolapsed vaginal wall is relaxed and flabby. When the cystocele is associated with complete uterine and vaginal prolapse, the bladder hangs outside of the orifice of the vagina in front of the uterus, and the diagnosis is made by the same methods as when the affection is uncomplicated (Figs. 237 and 238).

Differential Diagnosis.—The affection must be distinguished from an anterior vaginal hernia and a tumor situated in the vaginal wall. The physical signs, however, of a cystocele are so characteristic that an error in diagnosis is almost impossible when ordinary care is used. The following are the chief points in the differential diagnosis:

CYSTOCELE.	ANTERIOR VAGINAL HERNIA.
1. Situated in the anterior wall of the vagina.	1. Same.
2. Increases in size and tension on coughing or straining.	2. Same.
3. Disappears on pressure.	3. Disappears on pressure with a gurgling sound.
4. Tense and elastic when the bladder is full.	4. Always soft and doughy to the touch.
5. Only the vaginal and bladder walls between the examining finger and a sound in the bladder.	5. The thickness of the intervening structures is increased by the presence of the intestines.

CYSTOCELE.	VAGINAL TUMOR.
1. Situated in the anterior vaginal wall.	1 Same.
2. Increases in size and tension on coughing or straining.	2. No increase in size and tension.
3. Disappears on pressure.	3. Does not disappear.
4. Tense and elastic when the bladder is full.	4. Condition of the bladder has no effect upon the tumor.
5. Only the vaginal and bladder walls between the examining finger and a sound in the bladder.	5. The thickness of the intervening structures is increased by the presence of the tumor.

Results.—In small cystoceles the vaginal wall is usually hypertrophied as the result of subinvolution, and the size of the prolapsed portion of the bladder is correspondingly increased. Gradually, however, as the affection develops the bladder bulges more and more, and atrophy occurs. The vaginal wall then loses its folds or rugæ and becomes stretched and thin and the mucous membrane has an anemic or blanched appearance. When the condition is associated with complete prolapse of the uterus, the vaginal mucous membrane may become cutaneous in character or even ulcerated from friction and exposure to the air. There is always more or less dilatation of the bladder in chronic cases of cystocele and in rare instances the ureters may become distended from constriction.

Upon general principles we would naturally conclude that cystitis and urethritis were of frequent occurrence owing to the irritation produced by alkaline

FIG. 235.—SECTIONAL VIEW.

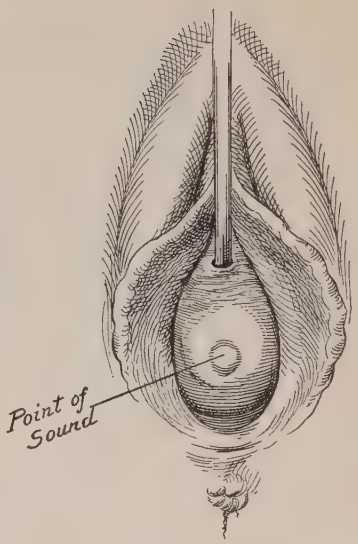


FIG. 236.—FRONT VIEW.

DIAGNOSIS OF A CYSTOCELE (page 249).

Fig. 235, showing the tip of a sound in the cele pressing through the vaginal wall against the finger; Fig. 236 showing the elevation on the vaginal wall caused by the tip of a sound in the cele.

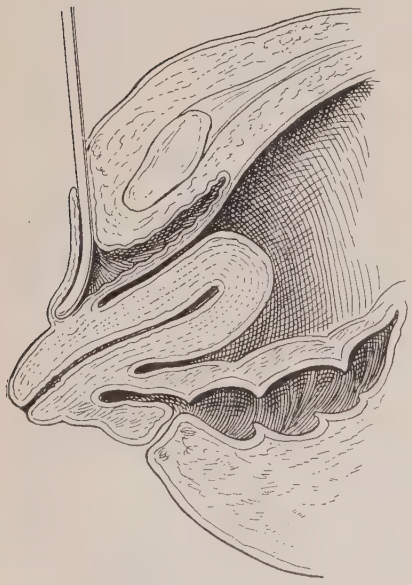


FIG. 237.—SECTIONAL VIEW.

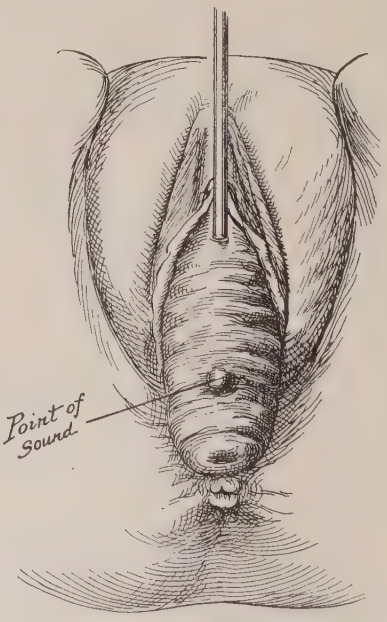


FIG. 238.—FRONT VIEW.

DIAGNOSIS OF A CYSTOCELE ASSOCIATED WITH PROLAPSE OF THE UTERUS AND VAGINA (page 249).

Showing the bladder outside of the vagina in front of the cervix.

decomposition of the residual urine and the dislocation of the parts. On the contrary, however, these affections are not often met as complications of cystocele unless the bladder becomes infected from other causes.

Prognosis.—Prolapse of the bladder has no tendency toward spontaneous cure, and the condition usually goes from bad to worse until the entire bladder becomes dislocated. The operative prognosis depends upon the general state of the pelvic organs, the cause of the prolapse, and the age of the patient. In young women a complete cure usually follows the repair of the perineum and a

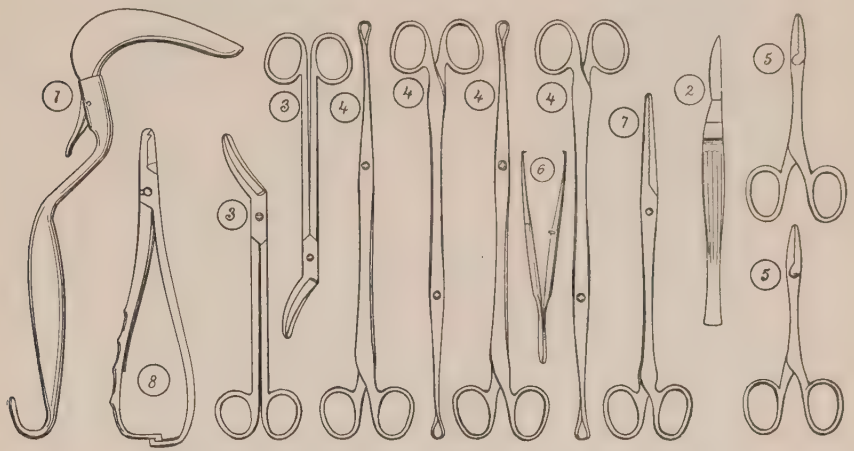


FIG. 239.—INSTRUMENTS USED IN ANTERIOR COLPORRHAPHY (page 252).

narrowing of the anterior wall of the vagina. When, however, a woman is advanced in years and has lost flesh, or there is a general relaxation of the pelvic structures, it is practically impossible to restore the parts completely to their normal condition, and the best that can be hoped for is to lessen the degree of dislocation and relieve the bladder symptoms.

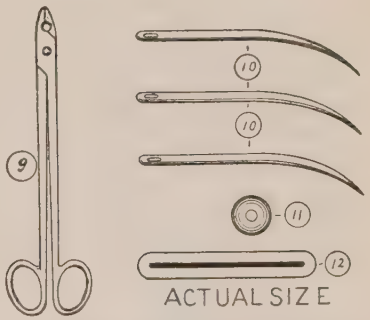


FIG. 240.—SHOT COMPRESSOR, NEEDLES, PERFORATED SHOT, AND SUTURE MATERIAL USED IN ANTERIOR COLPORRHAPHY (page 252).

The prognosis is always influenced by the condition of the vaginal walls, and when they are atrophied, thin, and overstretched it is unfavorable; but when they are thick and have not lost their contractile powers, it is good. If the cystocele is associated with complete prolapse of the uterus, it cannot be relieved unless the uterine dislocation is permanently corrected.

Treatment.—The treatment is divided into (1) the radical, and (2) the palliative.

Radical Treatment.—The radical treatment is operative and consists in the repair of the perineum and the posterior vaginal wall (*colpoperineorrhaphy*) and narrowing of the anterior wall of the vagina (*anterior colporrhaphy*). The

perineal operation is generally indicated because the majority of cystoceles are caused by a laceration of the perineum, and unless the integrity of the pelvic floor is restored an anterior colporrhaphy alone will be followed by a recurrence of the prolapse.

Colpoperineorrhaphy.—The technic of this operation is fully described on page 802.

Anterior Colporrhaphy (Anterior Elytrorrhaphy).—This operation consists in narrowing the anterior wall of the vagina by denuding a portion of its surface and suturing the edges together. There are a large number of operations advised for this purpose, differing from each other only in the shape of the denudations, and consequently the technic of all is practically the same.

Technic of the Operation.—The Preparation of the Patient and the Preparations for the Operation are described on pages 830 and 831.

Position of the Patient.—Dorsal position.

Number of Assistants.—An anesthetizer, two assistants, and a general nurse are required.

Instruments.—(1) Simon's speculum (curved blade); (2) scalpel; (3) right and left Emmet's slightly curved scissors; (4) four bullet forceps; (5) two short hemostatic forceps; (6) tissue forceps; (7) dressing forceps; (8) needle-holder; (9) shot compressor; (10) three slightly curved, round-pointed needles; (11) perforated shot; (12) silkworm-gut—15 strands (Figs. 239 and 240).

Operation.—First Step.—The speculum is introduced into the vagina and held by an assistant. The anterior vaginal wall is then seized with bullet forceps about half an inch above the external urinary meatus and just below the junction of the vaginal vault with the cervix.

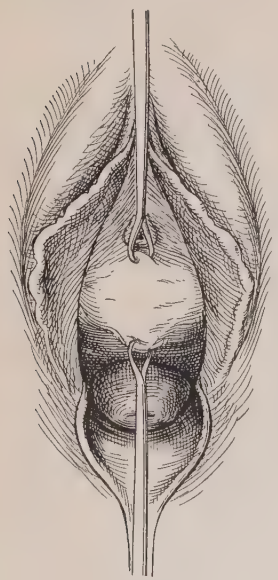


Fig. 241.—Anterior Colporrhaphy—First Step.

Second Step.—The speculum is withdrawn and the upper part of the vaginal wall pulled down into the orifice of the vagina. Traction is then made in opposite directions with the two pairs of forceps and the vaginal wall seized on each side by additional bullet forceps midway between the cervix and the external urinary meatus.

The distance between the two lateral forceps depends upon the size of the cystocele, and the correctness of their position can be tested by bringing them together and noting the amount of tension at that point. If the tension is found to be too great, the instruments are placed nearer to each other; if, on the other hand, the vaginal wall does not become sufficiently taut, they should be attached further apart.

Third Step.—The assistants make traction in opposite directions with the forceps and put the intervening vaginal wall upon the stretch, which forms a flat diamond-shaped surface. A straight incision is then made through the mucous membrane between the four points on the vaginal wall grasped by the forceps.

This incision marks the boundary-line of the area to be denuded and gives a clean-cut margin for approximation.

Fourth Step.—The diamond-shaped surface between the lines of incision is denuded by picking up the mucous membrane with tissue forceps and cutting it away in strips with scissors.

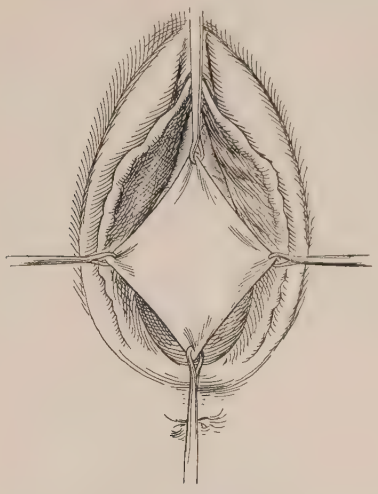


Fig. 242.—Second Step.

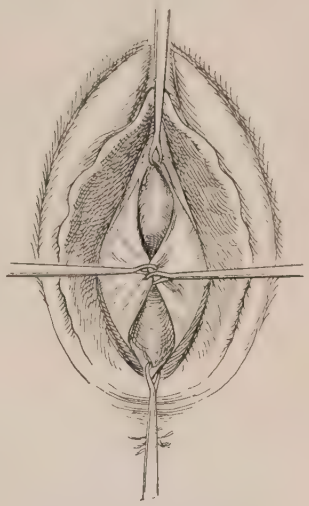


Fig. 243.—Second Step.

Anterior Colporrhaphy.

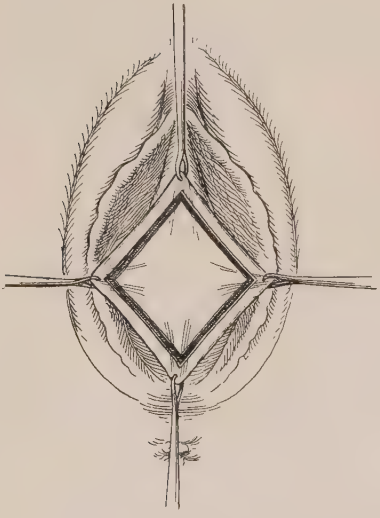


Fig. 244.—Third Step.

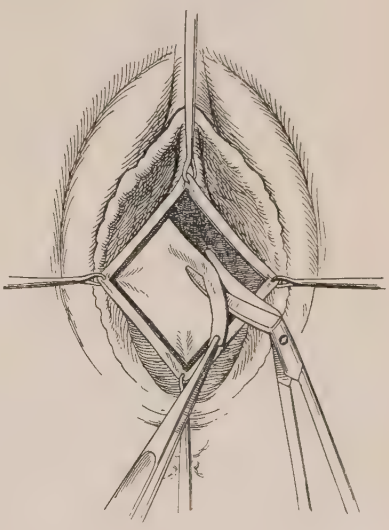


Fig. 245.—Fourth Step.

Anterior Colporrhaphy.

Fifth Step.—The sutures are introduced as follows: The first suture is passed through the mucous membrane about $\frac{1}{4}$ of an inch from the edge of the wound just below the external urinary meatus, carried completely under the denuded surface, and brought out upon the opposite side. The remaining sutures are then introduced in a similar manner. During the introduction of

the sutures the denuded area should be kept taut and care should be taken not to injure the bladder.

Sixth Step.—After the sutures are all in position the lateral bullet forceps are removed and the edges of the wound approximated with perforated shot.

The free ends of the sutures are tied in a knot and pushed up into the vaginal canal.

Seventh Step.—The vagina is irrigated with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and dried. A loose tampon of gauze is then introduced and the vulva protected with a compress secured by a T-bandage.

While the majority of operators tie the sutures, I prefer to secure them with perforated shot, as the amount of tension can be accurately estimated when the edges of the wound are brought together, and they are also more easily removed from the tissues. Silkworm-gut is the best suture material to employ, except

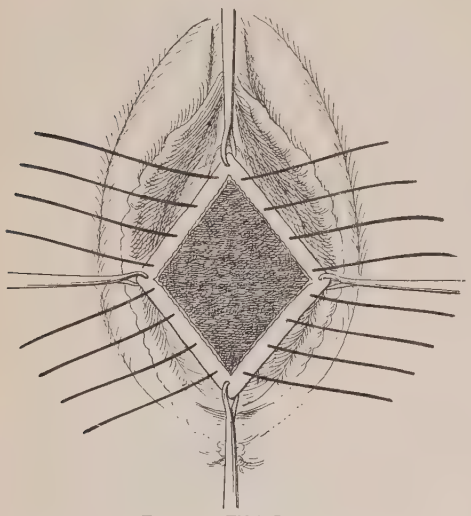


Fig. 246.—Fifth Step.

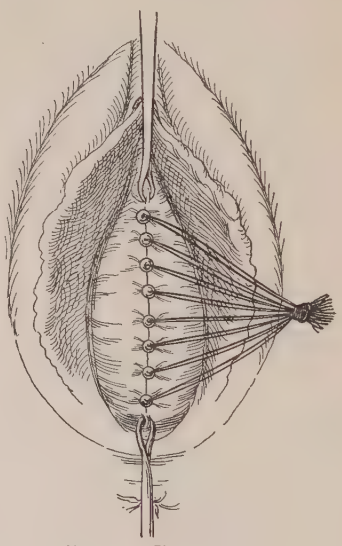


Fig. 247.—Sixth Step.

Anterior Colporrhaphy.

when the operation is combined with a perineorrhaphy or a colpoperineorrhaphy, in which case No. 3 cumol catgut should always be used in order to avoid the necessity of removing the sutures and thus endangering the integrity of the perineal wound.

Variations in the Technic.—The shape of the denuded surface may be oval, figure 248; or the vagina may be narrowed by denuding two or more surfaces and folding them upon each other, as in Sims's operation, figure 249; and, finally, some operators advise that the denudation be made transversely, as in Reed's operation, figure 250. The effect of the last method, however, is to shorten the vagina and pull down its upper portion, and consequently there is no support given to the prolapsed bladder.

If a cystocele is associated with uterine prolapse, the latter condition must be cured by operative measures and an anterior colporrhaphy performed at the same time.

After-treatment.—Care of the Wound.—The gauze packing is removed in forty-eight hours and not reintroduced, and the vagina irrigated once a day with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution. After the patient gets out of bed the antiseptic douche should be discontinued and the vagina irrigated with a gallon of hot saline solution once a day for several weeks.

The stitches are removed on the eighth day.

The Bladder.—The urine must be voided spontaneously or drawn by a catheter every six hours for the first two weeks. As a rule, the patient has no trouble in passing her urine, but if necessary a catheter must be used or the distention will cause an injurious traction upon the sutures in the vaginal wall.

The Bowels.—The bowels are moved in twenty-four hours with a mild laxative, followed by a simple enema, and then kept open every day by the same means.

The Diet.—The diet is regulated as follows: During the first forty-eight hours liquid diet (see p. 106); then soft diet until the end of the week (see p. 111); and finally convalescent diet (see p. 114).

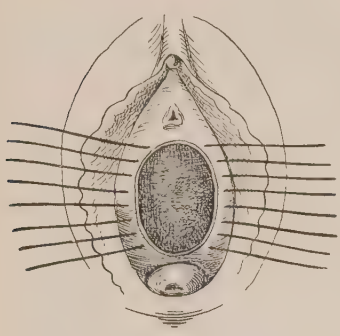


Fig. 248.

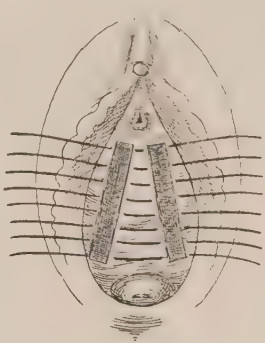


Fig. 249.

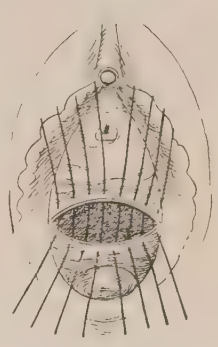


Fig. 250.

Variations in the Technic of Anterior Colporrhaphy.

Fig. 248, Oval denudation; Fig. 249, Sims's operation; Fig. 250, Reed's operation.

Restlessness; Pain.—There is generally no occasion for the use of drugs, but sometimes patients are restless or suffer more or less pain, and under these conditions an eighth to a quarter of a grain of morphin is given hypodermically and repeated if necessary. After the first twenty-four hours if the patient is restless at night or does not sleep, sulphonal or trional is administered.

Getting Out of Bed.—The patient should remain in bed for two weeks after an operation for a small cystocele, and in cases in which the lesion is pronounced the time should be extended to twenty-one days. The patient should not leave her room for at least one week after getting up and sexual relations should not be resumed for two months.

Lessening the Intra-abdominal Pressure.—It is important during the first six months after the operation for the intra-abdominal pressure to be reduced to a minimum and to guard the patient against any sudden weight being placed upon the pelvic organs; otherwise the vaginal prolapse may recur and the bladder become dislocated again. As a preventive measure, therefore, the patient must be instructed not to lift heavy weights, take violent exercise, or do anything that calls for strong muscular effort, and an abdominal supporter should be worn for one year to relieve the pressure of the intestines upon the

pelvic organs. If the abdominal walls are flabby, the retentive power of the abdomen must be sustained by wearing the supporter for an indefinite period and the muscles strengthened by using indoor exercises, as described in Chapter X.

Palliative Treamtent.—It is important to have a clear idea of the treatment of cystocele from a palliative standpoint, because we often meet cases where radical measures are not indicated or where the prolapse has recurred after an anterior colporrhaphy has been performed. Thus, women who have passed the menopause and are thin or who have a general relaxed and flabby condition of the pelvic structures are poor subjects for a radical operation. Again, large cystoceles associated with an atrophied state of the vaginal walls are seldom cured, and women who have lost flesh and fat as the result of a chronic disease are often not benefited by operative measures.

The palliative treatment only aims to lessen the severity of the bladder symptoms by controlling the degree of prolapse by the following means:

Repair of the perineum.
Lessening the intra-abdominal pressure.
Tampons, Injections, Suppositories.
Pessaries.

Repair of the Perineum.—All tears in the pelvic floor must be repaired, as the tonicity of the perineum is necessary not only to support the

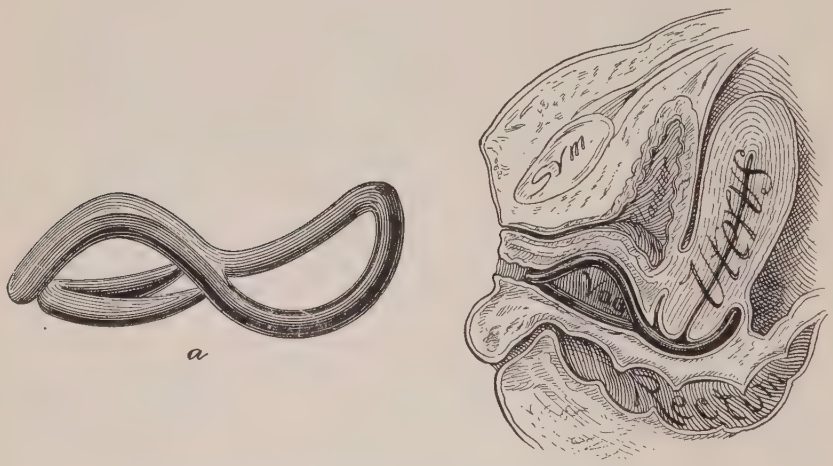


Fig. 251.—Skene's Pessary for Prolapse of the Bladder in Position.
Illustration *a* shows the construction of the pessary.

organs of the pelvis, but also to sustain in position the mechanic appliances employed to keep up the prolapsed bladder. The technic of perineorrhaphy is described on page 802.

Lessening the Intra-abdominal Pressure.—The majority of these women have relaxed and pendulous bellies which destroy almost entirely the retentive power of the abdomen. An abdominal supporter must therefore be worn to relieve the pressure of the intestines upon the pelvic organs, and the strength of the abdominal muscles should be increased by appropriate indoor exercises. (See Chapter X.) The patient should be warned against violent forms of muscular effort, such as lifting heavy objects, etc., and she

should also be instructed not to wear clothing that constricts the waist. It is also important to have the bowels kept regular and to empty the bladder every six or eight hours.

Tampons; Injections; Suppositories.—In some cases the daily introduction of a tampon of cotton-wool saturated with a solution of alum, zinc, or tannin often serves a useful purpose and contracts the vagina by its astringent action. The tampon is also a mechanic support to the prolapsed bladder, and if it is properly made the organ is kept up sufficiently high in the pelvis to relieve the difficulty experienced during urination. Sometimes better results are obtained by using dry tampons, which are dusted over with tannin or powdered alum and then introduced into the vagina.

Vaginal douches should be used night and morning as a routine plan of treatment as follows: A gallon of hot normal salt solution is injected into the vagina and the parts then flushed with a quart of hot water containing alum, zinc, or tannin.

Vaginal suppositories containing zinc, tannin, or alum often serve a useful purpose and may be substituted at times for the astringent injections.

Pessaries.—Good results are obtained from a symptomatic standpoint by the use of a pessary which supports the anterior wall of the vagina and pushes up the prolapsed bladder. Skene's pessary is the only instrument of which I have any knowledge that gives satisfactory results. It is made in several sizes and is introduced into the vagina in the same manner as a retroversion pessary.

Before employing a pessary for the relief of a cystocele it is always advisable to use astringent tampons for a few weeks to harden and contract the vagina.

RECTOCELE.

Synonyms.—Prolapse of the rectum; Prolapse of the posterior wall of the vagina; Rectovaginal hernia.

Definition.—A prolapse of the posterior wall of the vagina accompanied by a protrusion of the anterior rectal wall into the pouch (Figs. 252 and 253). Prolapse of the posterior wall of the vagina is not always, strictly speaking, a correct synonym for rectocele, because in rare cases, owing to the loose anatomic connection between the two organs, a dislocation of the vaginal wall may occur without any protrusion of the rectum (Fig. 259).

Causes.—The causes are classified as follows:

1. Frequent causes.
   - (*a*) Lacerations of the perineum and pelvic floor.
   - (*b*) Prolapse of the uterus.
2. Occasional causes.
   - (*a*) Sudden muscular effort resulting in acute uterine and vaginal prolapse.
   - (*b*) Subinvolution of the vagina following labor.
   - (*c*) General relaxation of the structures of the pelvis from disease or frequently repeated labors.

In the great majority of cases a rectocele is caused by a laceration of the perineum and pelvic floor which results in a loss of support to the vagina and pelvic organs and interferes with the normal mechanism of defecation. The tonicity of the perineum being essential to the equilibrium of the organs of the pelvis, it follows that when this is destroyed the structures tend to prolapse, and consequently the posterior wall of the vagina begins to sag, until eventually it forms a bulging

tumor at the vaginal entrance. The first step, therefore, in the formation of a rectocele is a prolapse of the posterior vaginal wall, and for a short period of time, as a rule, the rectum remains in its normal position, but sooner or later it is forced forward and downward into the vagina. In a normal woman during the act of defecation the vaginal canal is closed, the perineum elevated, and the anal sphincter dilated by the contraction of the levator ani muscle. The effect of this combined action, which is further assisted by the pelvic fascia, is to give a firm support to the anterior wall of the rectum during the expulsion of the feces. The opposing force of the perineum at the same time directs the fecal matter through the sphincter, which being relaxed is dilated by the contraction of the levator ani muscle.

When the pelvic floor and perineum are torn, the mechanism of defecation is entirely changed, and the force of the intra-abdominal pressure against the fecal

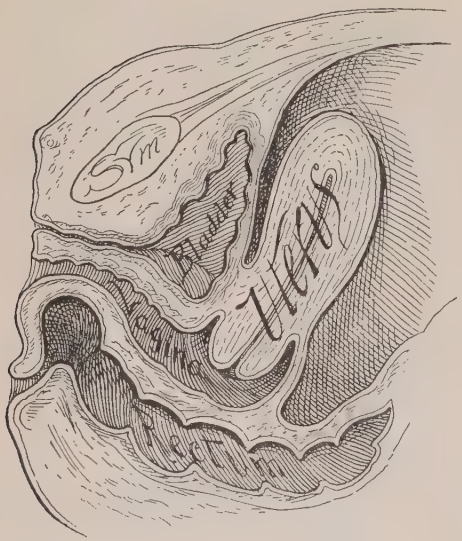


Fig. 252.—Sectional View of a Rectocele (page 257).

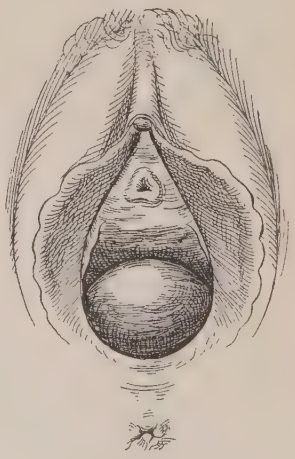


Fig. 253.—Front View of a Rectocele (page 257).

mass is wasted and the woman is obliged to strain violently to overcome the deficiency. As the feces descend along the rectum it meets with no guiding forces, and, seeking the direction of least resistance, it pushes the posterior wall of the vagina forward and downward. The fecal matter higher up in the rectum now crowds against the mass below, which has been temporarily arrested by the absence of counter-pressure from the perineum and levator ani muscle, until it eventually reaches the sphincter, only to find it contracted. Still more violent bearing-down efforts are now required to force the feces through the anal opening, which is normally dilated by the levator ani. The anterior rectal wall and the posterior wall of the vagina receive the brunt of the strain, and as a result they protrude more and more until finally a rectocele appears beyond the vulvar opening.

Frequency.—Rectocele is a very frequent form of prolapse in the lower classes, for the reasons already given in discussing the frequency of cystocele.

Symptoms.—The symptoms naturally depend upon the extent of the prolapse, and in slight cases the patient may not be aware of its existence.

The chief symptoms are:

A sensation of distention at the vulvovaginal orifice.

A sensation of weight and dragging in the pelvic cavity.

Difficulty in defecation.

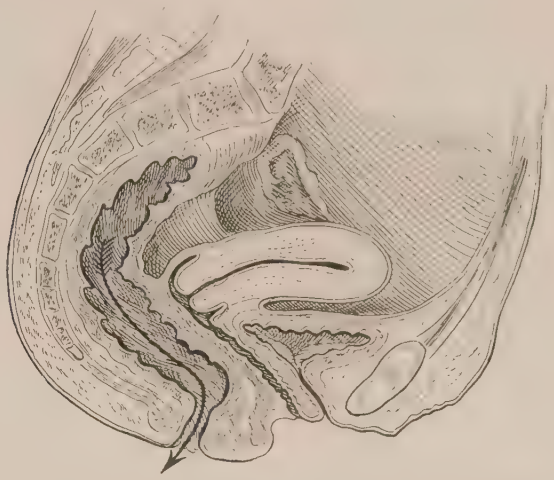


FIG. 254.—THE ARROW INDICATES THE DIRECTION TAKEN BY THE FECES DURING THE ACT OF NORMAL DEFECATION.

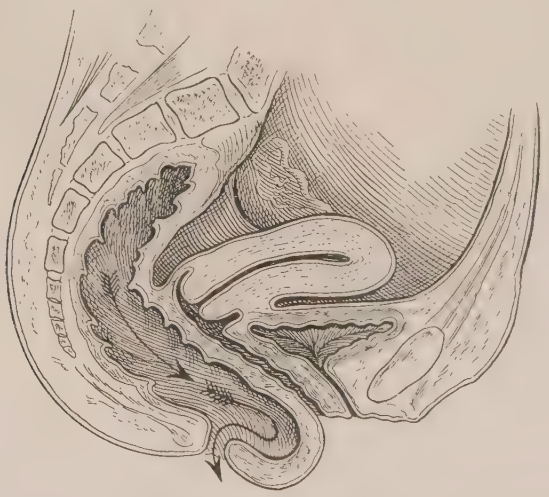


FIG. 255.—THE ARROWS INDICATE THE DIRECTION TAKEN BY THE FECES WHEN THE PELVIC FLOOR AND PERINEUM ARE SACCULATED.

Sensation of Distention at the Vulvovaginal Orifice.—The sensation of distention at the vulvovaginal orifice is due to the presence of the prolapsed vagina and rectum, and is only felt when the patient strains or assumes the erect posture. The woman often mistakes the protrusion for a prolapse of the uterus.

Sensation of Weight and Dragging in the Pelvic Cavity.—The pelvic symptoms are common to all forms of vaginal prolapse and are caused by the dislocated organs pulling upon the adjacent structures.

Difficulty in Defecation.—The interference of a rectocele with the normal mechanism of defecation has been referred to above. The violent efforts which are required to empty the bowel when the rectocele is pronounced are often very distressing to the patient and she frequently assists herself by pushing up the prolapse with her fingers. The rectum is not entirely emptied in marked cases and there is always more or less rectal tenesmus or a sensation of incompleteness following defecation.

Diagnosis.—The physical signs are characteristic and the diagnosis easily made. When the patient lies upon her back and separates the knees, there is but little evidence of a bulging tumor except in pronounced cases; but when she strains or stands erect, the rectocele presents itself at or beyond the vulvar opening

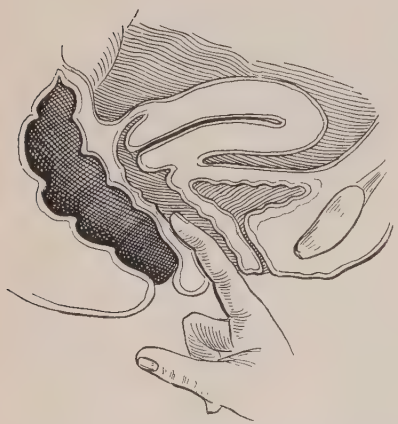


FIG. 256.—RECTOCELE.
Shows obliteration of the cele with the index-finger.

FIG. 257.—DIAGNOSIS OF A RECTOCELE. SECTIONAL VIEW.
Showing the rectocele bulging beyond the vaginal orifice when the patient strains.

as a soft globular mass which disappears on pressure. The swelling increases in size and becomes tense when she bears down, but it relaxes again and becomes smaller when the intra-abdominal pressure is relieved.

The positive test in the diagnosis is made by introducing the index-finger into the rectum and hooking it forward into the most dependent part of the prolapsed pouch, when the nature of the affection at once becomes apparent. If the case is one of prolapse of the vaginal wall alone, the rectal examination with the finger will reveal the fact that the rectum is not displaced.

When a rectocele is associated with complete uterine and vaginal prolapse, the anterior wall of the rectum hangs outside of the vagina behind the uterus, and the diagnosis is made by the same method.

Results.—In slight rectoceles the vaginal wall is generally thickened as the result of subinvolution. As the affection develops, however, the wall of the vagina loses its folds or rugæ and becomes atrophied and stretched, and the

mucous membrane has an anemic or blanched appearance. When the condition

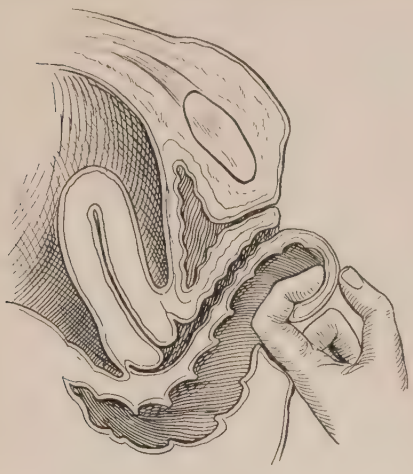


Fig. 258.

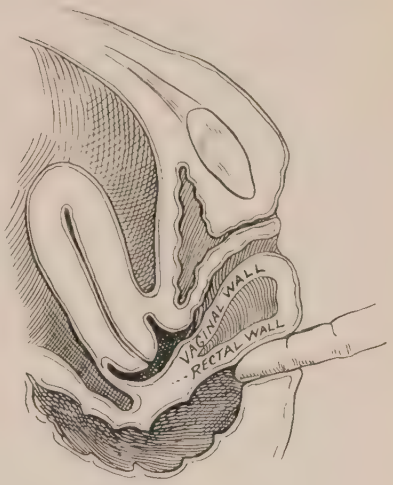


Fig. 259.

Diagnosis of a Rectocele.

Fig. 258 shows the index-finger in the rectum pushing the rectocele beyond the vaginal orifice; Fig. 259 shows prolapse of the vaginal wall without any displacement of the rectum. Note that the anterior rectal wall is taut.

is associated with uterine procidentia, the vaginal mucous membrane becomes hard or cutaneous in character and ulcerations may occur from friction and exposure to the air. Obstinate constipation is a frequent result of a large rectocele, as the bowel cannot completely empty itself and the rectal reflexes become blunted. The accumulation of feces in the rectum increases the severity of the local trouble and the blood becomes poisoned by the absorption of fecal material. Chronic inflammation and ulceration of the rectal mucous membrane may occur, and hemorrhoids, fistulas, and anal fissures are often traced to the same source. In rare cases where the rectum does not prolapse along with the vagina the culdesac of Douglas pushes down between the vaginal wall and rectum and the intestines descend and form an enterocele or hernia.

Large rectoceles are generally associated with sterility on account of the escape of semen at the time of sexual intercourse.

Fig. 260.—Diagnosis of a Rectocele Associated with Prolapse of the Uterus and Vagina.

Showing the anterior wall of the rectum outside of the vaginal orifice behind the cervix.

Prognosis.—A rectocele has no tendency toward spontaneous cure and generally goes from bad to worse until the prolapse becomes marked and the vaginal

wall atrophied and stretched. The operative prognosis depends upon the condition of the pelvic organs and the age of the patient. In young women a colpoperineorrhaphy is generally successful, but if the patient is advanced in years or has lost flesh, or there is general relaxation of the pelvic structures, the best that can be hoped for is to lessen the degree of prolapse and relieve the rectal symptoms. Again, when the vaginal wall is atrophied and thin the results of operative interference are bad, and if the rectocele is associated with complete prolapse of the uterus the prognosis depends upon the curableness of the latter condition.

Treatment.—The treatment is divided into (1) the radical and (2) the palliative.

Radical Treatment.—The radical treatment consists in the repair of the perineum and the pelvic floor (*colpoperineorrhaphy*). If the case is associated with other forms of prolapse, they must also be operated upon at the same time, otherwise the equilibrium of all the pelvic organs is not restored and the rectocele will recur.

Colpoperineorrhaphy.—The technic and after-treatment of this operation are fully described on page 802.

Palliative Treatment.—The palliative treatment aims to correct the difficulty in defecation by lessening the degree of prolapse, and is indicated in cases in which a radical operation is contraindicated or has been unsuccessful.

The treatment consists in:

Lessening the intra-abdominal pressure (see Cystocele, p. 256).
Tampons; Injections; Suppositories (see Cystocele, p. 257).
Care of the bowels.

Care of the Bowels.—It is important to keep the bowels regular and avoid the injurious results of chronic constipation, which are especially marked in cases of rectocele.

HERNIA.

Definition.—A vaginal hernia starts either behind or in front of the broad ligaments. In the former case it begins in the culdesac of Douglas and descends

Fig. 261.—Posterior vaginal hernia.

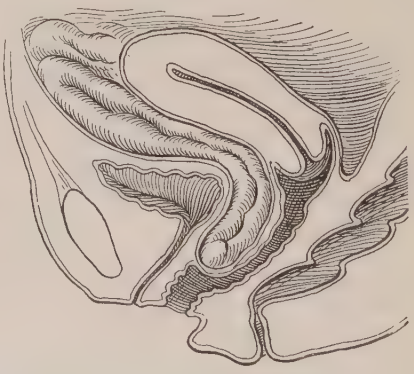


Fig. 262.—Anterior vaginal hernia.

Vaginal Hernia.

between the rectum and vagina. It then separates the fibers of the levator ani muscle and appears at the posterior part of the labium majus, or in the perineum. The second variety starts in the vesicouterine fold of peritoneum and, passing

between the bladder and vagina, finally protrudes at the posterior extremity of the labium majus.

Causes.—Lacerations of the perineum and relaxation of the structures of the pelvis due to labor are predisposing causes. Some authorities attribute the condition to a congenital malformation of the peritoneum and pelvic organs. This form of hernia is very rare, especially when it starts in front of the broad ligaments.

Symptoms.—In the beginning the hernia forms a tumor on the anterior or posterior wall of the vagina, but eventually it appears at the posterior part of the labium majus or in the perineum near the anus or the vulvovaginal orifice and presents the usual physical signs of enterocele.

Differential Diagnosis.—If the hernia is still within the vagina, it may be mistaken for a rectocele, a cystocele, or a tumor; and after it has appeared at the vulva, it may be confounded with a cyst of the vulvovaginal gland, a tumor of the labium, or an inguinal hernia that has descended into the labium majus.

A hernia situated on the anterior or posterior wall of the vagina is increased in size and becomes more tense upon coughing or straining; it disappears on pressure with a gurgling sound; it is soft and doughy to the touch; and the thickness of the intervening structures is found to be increased when a rectovaginal or a vesicovaginal examination is made.

A rectocele is always situated on the posterior wall of the vagina; it is increased in size and becomes tense upon coughing or straining; it disappears on pressure without a gurgling sound and only the rectal and vaginal walls intervene between the finger in the rectum and the thumb in the vagina.

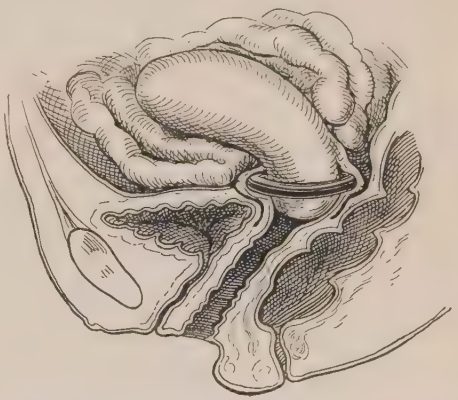


FIG. 263.—VAGINAL HERNIA (page 264).
Showing a hard-rubber ring pessary controlling the hernia.

A cystocele is always situated on the anterior wall of the vagina; it is increased in size and becomes tense upon coughing or straining; it disappears on pressure; it is tense and elastic when the bladder is full; and only the vaginal and bladder walls intervene between the finger in the vagina and a sound in the bladder.

A tumor may be situated in any part of the vagina; there is no increase in size and tension upon coughing or straining; it does not disappear on pressure; and is felt in the vaginal wall as a circumscribed mass over which the mucous membrane moves freely.

A cyst of the vulvovaginal gland or a tumor of the labium is circumscribed; its surface is smooth and firm; it is freely movable under the overlying structures; it does not disappear on pressure; and it is not increased in size and tension upon coughing or straining.

An inguinal hernia which has descended into the labium can always be distinguished from a vaginal enterocele by watching the direction that the intestine takes when the rupture is reduced.

Prognosis.—There is but little danger of strangulation, on account of the character of the false passage through which the intestine descends, unless the gut becomes pinched during a protracted labor.

Treatment.—The reduction of the hernia is easily accomplished, after emptying the bladder and rectum, by placing the patient in the knee-chest position and making steady pressure upon the tumor until the contents of the sac slip back into the abdominal cavity. The hernia is then controlled by introducing

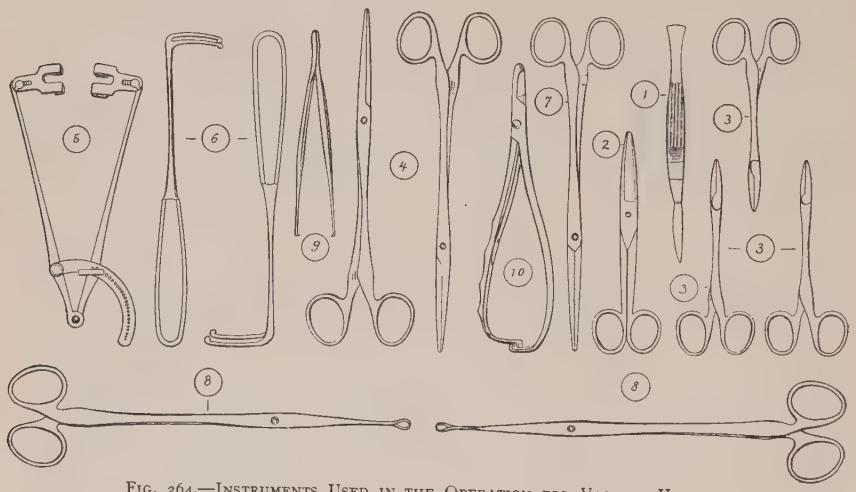


FIG. 264.—INSTRUMENTS USED IN THE OPERATION FOR VAGINAL HERNIA.

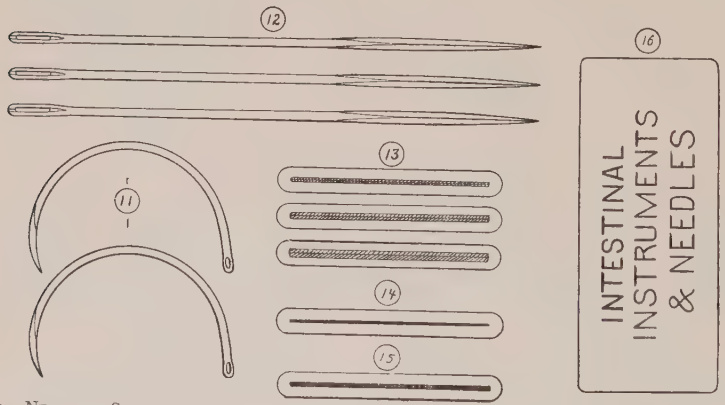


FIG. 265.—NEEDLES, SUTURE MATERIALS, AND INTESTINAL INSTRUMENTS USED IN THE OPERATION FOR VAGINAL HERNIA.

into the vagina a hard-rubber ring pessary large enough to distend the canal and obliterate the false passage (Fig. 263).

After the reduction of a hernia, if the woman is in labor, the pelvis should be kept elevated until the child's head passes the superior strait, by placing a pillow under the hips.

The use of pessaries in the treatment of vaginal enterocele is unsatisfactory, because the benefit derived is only temporary, and in the end they increase the

trouble by still further stretching the parts and lessening the strength of the tissues.

Radical Cure.—The operation for the cure of a vaginal hernia consists in opening the abdomen from above and closing the false passage with silk sutures. It is always necessary to repair the perineum if it is lacerated and perform an anterior and posterior colporrhaphy if a cystocele or rectocele is present. If the uterus is retrodisplaced or prolapsed, a ventral suspension or fixation should be performed at the same time.

Posterior Hernia.—*Technic of the Operation.*—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 834 and 837.

Position of the Patient.—Trendelenburg.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Instruments.—(1) Scalpel; (2) straight scissors; (3) three short hemostatic forceps; (4) two long-bladed hemostatic forceps; (5) Ashton's self-retaining abdominal retractors; (6) abdominal retractors; (7) dressing forceps; (8) two bullet forceps; (9) rat-tooth tissue forceps; (10) needle-holder; (11) two small full-curved Hagedorn needles; (12) three long, straight, triangular-pointed needles; (13) braided silk, Nos. 2, 7, and 12; (14) plain cumol catgut, No. 2, four envelopes; (15) silkworm-gut—25 strands; (16) intestinal instruments and needles—Murphy's button; anastomosis forceps; clamps; two straight and two curved intestinal needles.

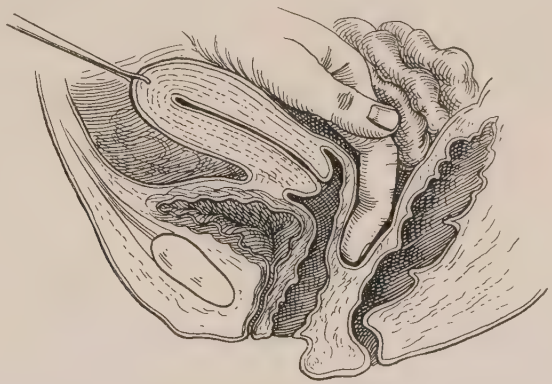


Fig. 266.—Operation for Vaginal Hernia—First Step.

Operation.—First Step.—After opening the abdomen the fundus of the uterus is seized with bullet forceps and pulled upward into the abdominal incision.

A careful inspection is then made of Douglas's culdesac to determine the presence of adhesions and ascertain how far the peritoneum dips down between the vagina and rectum. If the intestines are adherent to the sac, they are carefully separated and allowed to drop back into the peritoneal cavity.

Second Step.—The sac is pulled out of the false canal, seized with long-bladed hemostatic forceps, and tightly twisted upon itself. The sac is then ligated with a silk ligature (No. 12) and the redundant portion cut off (Figs. 267 and 268).

If the sac cannot be pulled out of the false canal on account of adhesions, the opening should be closed with interrupted silk sutures (No. 7) at the normal level of Douglas's culdesac (Fig. 269).

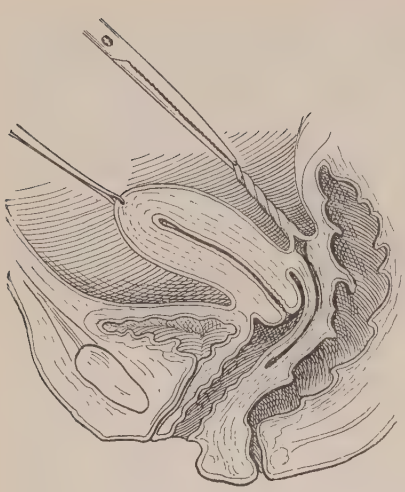


FIG. 267.—Second Step.

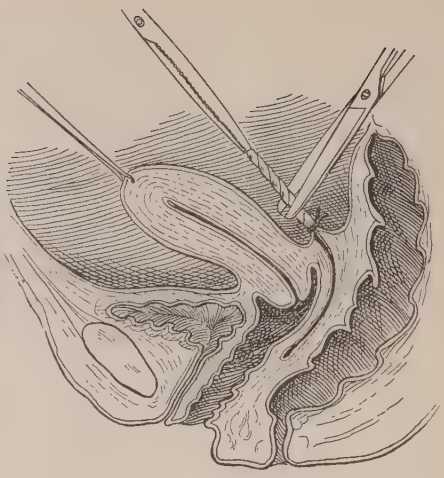


FIG. 268.—Second Step.

OPERATION FOR VAGINAL HERNIA (page 265).

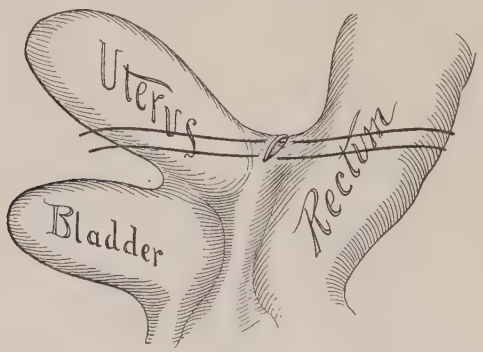


FIG. 269.—OPERATION FOR VAGINAL HERNIA—Second Step.
Shows the sutures in place for closing the false canal (page 265).

Anterior Hernia.—The technic is the same as described in the operation for a posterior hernia.

VAGINITIS.

Definition.—An inflammation of the mucous membrane of the vaginal canal.

Etiology.—The investigations of Döderlein and J. Whitridge Williams show that the normal secretions of the vagina rapidly destroy morbid bacteria and that they must first become abnormal in character before they can act as a culture-medium. It naturally follows, therefore, that any local or general condition which changes the nature of these secretions is a predisposing cause of vaginitis, and that the entrance of pathogenic germs alone or the action of irritants is not sufficient to inflame the mucous membrane. Thus, when the uterine discharges are increased in amount or altered in character by disease or during pregnancy, child-bed, or menstruation, the vaginal secretions are at once modi-

fied and form a good medium for the development of bacteria. Again, the same conditions occur when the uterine and vaginal secretions accumulate in the vagina from want of cleanliness after an operation, or when a pessary is worn or when a foreign body, such as a tampon, has been forgotten and left too long in position. And, finally, while the hymen under ordinary circumstances acts as a guard against the entrance of germs, it may at times predispose to vaginitis, especially if its opening is small, by retaining the discharges, which eventually become infected from masturbation or handling the parts. Acute vaginitis has often been traced to this cause in young children. "Irritation" (according to Pozzi) "is not, as held by the older authors, a sufficient cause. Burning with the red hot iron and the action of caustics will cause but a local lesion, an ulcer without surrounding inflammation, if injections be employed which prevent the accumulation of secretions, while the same lesion, or the presence of a foreign body otherwise aseptic, such as a pessary, will develop an intense vaginitis if with neglect of cleanliness we have the conditions which favor the development of the microbes."

The situation of the vagina renders it liable to attacks of inflammation through the entrance of pathogenic microbes from the uterus, the vulva, and the urethra, and the part the organ plays in sexual intercourse and labor exposes it to specific and septic infections. The congestion and hypersecretion of menstruation and pregnancy are also important predisposing factors, and, finally, traumatisms may expose the vagina to infection from outside influences.

Vaginitis may be a *primary* or *secondary* condition; the former occurs infrequently compared with those infections which have their origin in neighboring organs.

Varieties.—The disease presents itself under the following forms:

Simple vaginitis;
Gonorrheal vaginitis;
Granular vaginitis;
Senile vaginitis;
Emphysematous vaginitis.

Simple Vaginitis.

Definition.—A non-specific inflammation of the vaginal mucous membrane characterized by a free discharge.

Varieties.—The disease may be *acute* or *chronic* and also *primary* or *secondary*. The acute type is comparatively rare, while the chronic form is frequent. The affection may begin as an acute condition and gradually pass into the chronic stage, but generally, however, it starts as a subacute inflammation without marked local symptoms and with no constitutional reaction. The primary variety is not often met with, as the disease in most cases is secondary to an infection beginning in a neighboring organ.

Causes.—The **Primary Variety** may arise from any of the following causes:

Foreign bodies, such as pessaries, tampons, etc.
Retained discharges from a want of cleanliness after an operation, the presence of the hymen, and vaginal tumors;
Rectovaginal and vesicovaginal fistulas;
Irritation from excessive venery;
Infection from coitus or masturbation;
Exposure to cold;
Congestion and hypersecretion due to organic disease of the heart, liver, or kidneys; abdominal tumors; pregnancy and menstruation;

Labor and child-bed;
Seat-worms;
Gaping of the vulvovaginal orifice;
Caustic applications;
General diseases, such as chlorosis, anemia, debility, tuberculosis, constipation, and the exanthemata.

The **Secondary Variety** is due to the following pathologic conditions:

Uterine discharges (chief cause);
Inflammation of the vulva;
Infection of the kidneys, bladder, and urethra.

Subjective Symptoms.—Acute Variety.—The patient complains of a feeling of heat and pain in the vagina, fullness in the pelvis, a throbbing sensation in the perineum, and backache. All of these symptoms are exaggerated by any form of bodily exertion. There is usually a slight elevation of the temperature accompanied by more or less gastric disturbance and nervous irritability. At first the normal secretion of the vagina is lessened or suppressed, but in twenty-four to forty-eight hours it makes its appearance again as a thin, white, mucoid discharge, which soon becomes mucopurulent or purulent in character, and has a yellow or greenish-yellow color and a thick cream-like consistency. The discharge is usually profuse and offensive, and at times so irritating to the external organs that it causes an intense vulvar pruritus, which still further adds to the discomfort of the patient.

The severity of the local and general symptoms depends entirely upon the intensity of the inflammation. If menstruation occurs during an acute attack of vaginitis, all the local symptoms become more pronounced for the time being.

In simple vaginitis, unlike the gonorrheal form of the disease, the urethra is seldom involved, and consequently there is no pain on urinating.

Chronic Variety.—The chronic type of the disease is characterized by a vaginal discharge, more or less tenderness of the vagina, a slight sensation of fullness in the pelvis, and pruritus vulvæ. The general health may be affected by the drain upon the system from the leukorrhea and the distress and loss of sleep caused by the vulvar itching. In exaggerated forms of the affection neurasthenia is apt to develop as the result of general debility and mental worry over the local condition. The severity of the local and general symptoms depends upon the extent of the inflammation and the quantity and character of the discharge. In a large number of instances leukorrhea is the only symptom complained of by the patient, and, as a rule, the general health is more or less affected.

Objective Symptoms.—Acute Variety.—The mucous membrane is red, swollen, and hot, and more or less tender to the touch. The surface of the vagina is smooth and in the beginning of the attack the normal secretion is lessened or absent altogether, but in twenty-four to forty-eight hours a thin, white, mucoid discharge appears, which rapidly becomes mucopurulent and finally purulent in character. The vaginal mucous membrane and the external organs are bathed in the discharge, which becomes foul and very offensive unless the parts are kept carefully cleansed. The entire surface of the vagina is not involved, as a rule, and patches of inflammation separated from each other by healthy tissue may be seen scattered over the vaginal mucosa. In some cases, however, the inflammation is general and the entire surface is affected. This is likely to occur when the disease is due to the exanthemata or is caused by a corrosive injection. As the disease progresses the infection spreads to the external organs and symptoms of acute vulvitis present themselves.

Chronic Variety.—All the signs of acute inflammation are absent. The parts are no longer tender to the touch and a thorough inspection of the vagina may be made through a speculum without causing any discomfort to the patient. The mucous membrane is dark red or bluish in color; it is more or less thickened; and patches of erosion may be seen here and there in bad cases. The discharge is thinner and less purulent than in the acute stage, and as the disease becomes more and more chronic the inflammation gradually retreats to the vaginal culdesac or vault, where it remains in a latent state for an indefinite length of time, becoming, however, somewhat active again during menstruation and pregnancy.

Diagnosis.—The patient is placed in the knee-chest position and the vagina exposed with a Simon's speculum. The entire canal is then carefully inspected and the condition of the mucous membrane noted.

It is necessary to determine whether the disease is a *primary* or *secondary* condition, because no treatment will be successful which is applied to the vagina alone in cases in which the affection has its origin in a neighboring organ and there is a continual reinfection of the vaginal mucous membrane taking place.

While the discharge is a prominent symptom of vaginitis, it must not be forgotten that a profuse mucopurulent or purulent leukorrhea may escape from the vagina without the mucous membrane being inflamed, and that, under these circumstances, the vaginal canal is simply a drainage-tube for the exit of pus which may come from a pelvic abscess that has ruptured into the vagina or from the uterine cavity.

Differential Diagnosis.—The differentiation between the *primary* and *secondary* varieties is usually not difficult. The former is comparatively rare, the history of the case and the cause are, as a rule, clear and definite, and the inflammation begins acutely. The latter variety, on the other hand, is more frequent, the history is unsatisfactory, the disease usually begins as a subacute or chronic condition, and the cause is traceable to a septic discharge from one of the neighboring organs.

Simple vaginitis must be distinguished from:

Gonorrheal vaginitis.

Discharges from the uterus or a pelvic abscess.

Gonorrheal Vaginitis.—The history of the case is significant. The disease begins acutely, there may be a history of a suspicious intercourse, and the subjective and objective symptoms are more intense than in the simple variety. The inflammation is violent, the discharge is profuse and purulent, the urethra is involved, which is not the case in the non-specific form, and there is a marked tendency for the disease to spread to neighboring organs. Vulvitis is a constant complication, and the vulvovaginal glands are, as a rule, infected. The inflammation also spreads upward and involves the uterus and the oviducts, and symptoms of grave pelvic disease may manifest themselves. Ophthalmia or vulvitis developing in other members of the family is a strong point of evidence in favor of the gonorrheal origin of the infection. It must, however, be remembered that cases of simple vaginitis are contagious when the discharge is profuse and purulent and proper precautions are not taken to prevent infection. The differentiation between the simple and specific forms of vaginitis in young children is very important from a medico-legal point of view. The traumatic evidences of rape, if they are present, will indicate the possible existence of gonorrhea.

The positive proof of the specific nature of the disease is the presence of gonococci, and the discharges from the uterus, vagina, urethra, and vulva should therefore be examined microscopically.

Discharges from the Uterus or a Pelvic Abscess.—A speculum examination reveals the origin of the discharge and an absence of the objective symptoms of vaginitis.

Prognosis.—The *acute* variety responds readily to treatment and lasts about two or three weeks; the *chronic* form is difficult to cure and often lasts for an indefinite length of time without any other symptom than the discharge. The disease does not, as a rule, spread to neighboring organs, and the general health does not suffer except in chronic cases in which the discharge is profuse and the constant drain upon the system causes debility and loss of nervous energy. The possible infection of the uterine cavity and the subsequent extension of the inflammation to the oviducts must always be borne in mind in considering the results and treatment of vaginitis. The prognosis of secondary vaginitis depends upon the situation of the primary infection.

Treatment.—The treatment is divided into (1) the removal of the cause and (2) the treatment of the disease.

Removal of the Cause.—Whenever possible, the cause of the inflammation must be removed (see etiology of primary and secondary vaginitis).

Treatment of the Disease.—In the **acute form** the disease is treated as follows:

Rest.—Absolute rest in bed for one or two weeks is essential even in mild cases.

Bowels.—Salines should be freely used in the early stages (the first three or four days), and later on a simple laxative with an occasional dose of salts are all that will be required.

Diet.—The diet should be regulated as follows: During the first week liquid diet (see p. 106); then soft diet (see p. 111) until the patient gets out of bed; and, finally, a convalescent diet (see p. 114), followed by the gradual return to ordinary articles of food.

Pain.—Opium should be administered whenever the pain is severe, and it should be given hypodermically rather than by suppositories, as the latter method may spread the infection to the rectum.

Cleanliness and Local Medication.—The cure of the affection depends upon prompt local treatment. As the inflammation is always due to infection, the object of the treatment is to destroy and remove the pathogenic microbes which are responsible for the disease. This is accomplished by the use of cleansing and antiseptic douches, which are given three times a day (morning, noon, and night). A gallon of corrosive sublimate solution (1 to 2000) is injected into the vagina and followed by a quart of normal salt solution. A cotton-wool tampon is then saturated with an aqueous solution of argyrol (25 per cent.) and placed in the vagina. After the patient gets out of bed the douches are given twice a day (night and morning) and an argyrol tampon placed in the vagina at bedtime. The treatment is discontinued when all signs of inflammation have disappeared and a douche of at least a gallon of hot normal salt solution given night and morning for several weeks.

Variations in the Treatment.—The use of hot alkaline or emollient sitz-baths (see p. 213) will be found very beneficial where pain and pelvic distress are prominent symptoms. The baths are employed once or twice a day according to the indications.

In rare instances an abscess may form in the vaginal wall (*phlegmonous vaginitis*) during an acute attack of inflammation. The treatment consists in evacuating the pus by a free incision, irrigating the abscess cavity with a solution of corrosive sublimate (1 to 2000), and packing it with gauze.

In the **chronic form** the disease is treated as follows:

Rest.—The patient should not be confined to the house, but should be encouraged to take plenty of exercise in the open air and sunshine.

Bowels.—Any tendency to constipation should be corrected by the use of a mild laxative and the occasional administration of a saline.

Diet.—An easily digested and nourishing diet is indicated.

Cleanliness and Local Medication.—The vagina is douched night and morning with a gallon of corrosive sublimate solution (1 to 2000), followed by a quart of saline solution, and a vaginal tampon saturated with an aqueous solution of argyrol (25 per cent.) is introduced at bedtime. The treatment is continued for one week and then astringent injections are substituted for the corrosive sublimate solution and the argyrol tampons. They are given night and morning immediately following a douche of normal salt solution. The best astringents to employ are boric acid (saturated solution) and sulphate of copper (gr. iij to f℥j), or zinc (gr. iij to f℥j). At the end of two or three weeks if the discharge and inflammation still continue, the vagina is exposed with a speculum and painted with a solution of nitrate of silver (gr. xxx to f℥j). The patient is placed in the knee-chest posture and Simon's speculum introduced into the vagina, which is thoroughly cleansed by swabbing it out with pledgets of cotton saturated with hot water. It is then dried with absorbent cotton and the entire mucous membrane painted with the solution of nitrate of silver. The vagina is then loosely packed with iodoform gauze and a compress and T-bandage applied. The silver is reapplied every four or five days for three weeks, and in the meantime a fresh tampon is inserted every twenty-four hours after irrigating the vagina with a gallon of hot water. The patient should be placed in the dorsal position and Simon's speculum introduced when the daily change of dressings is made. After the nitrate of silver and tampon treatment has been carried out for some time, the patient should use an injection night and morning of a quart of creolin or lysol solution (1 per cent.) for several months.

Variations in the Treatment.—Astringent powders are often used with good results in place of the injections recommended in the routine treatment. The best preparations are boric acid, subnitrate of bismuth, oxid of zinc, calomel, or tannin, alone or in combination. The proper method of applying the powder is to place the patient in the dorsal posture and introduce Simon's speculum. The vagina is then douched with a gallon of hot normal salt solution, dried with pledgets of cotton, and a half an ounce of the powder placed in the vaginal vault. A cotton-wool tampon is then inserted into the vagina and pushed well up into the culdesac to keep the powder in position. This treatment is continued daily for two or three weeks.

As patients often object to the odor of iodoform, it is necessary to employ some other remedy to apply on the tampon which is used in the nitrate of silver stage of the treatment, and under these circumstances boroglycerid or carbolated vaselin (3 per cent.) is a good substitute and should be used on a cotton-wool tampon. Erosions are treated by occasionally touching them with the solid stick of nitrate of silver or painting them with a solution of the salt (gr. xxx to f℥j).

Gonorrheal Vaginitis.

Definition.—A specific inflammation of the vagina caused by the gonococcus.

Varieties.—The disease may be *acute* or *chronic*, and also *primary* or *secondary*. The acute form is rare, while the chronic type is more or less common. The disease may begin as an acute condition and gradually pass into the

chronic stage, but generally, however, it starts as a subacute inflammation without marked local signs. The primary variety is rare in the adult owing to the resisting power of the vaginal epithelium and to the "phagocytic action of the acid-forming bacillus of the vagina" (Döderlein). In children, however, the mucous membrane has not the same power of preventing the invasion of microbes, and consequently the disease is comparatively frequent. Gonorrhea of the vagina is usually secondary to an infection beginning elsewhere. It starts most frequently in the urethra, next in the cerivcal canal, and lastly in the vulva, and from any one of these situations the disease gradually spreads to the vaginal mucous membrane.

Subjective Symptoms.—Acute Variety.—The symptoms are the same as in acute simple vaginitis except that they are more intense. It must also be borne in mind that other organs are usually involved along with the vagina, and that symptoms of urethritis, endometritis, and vulvitis are added to those dependent upon the vaginitis.

Chronic Variety.—The symptoms are the same as in chronic simple vaginitis except that acute exacerbations are more likely to occur during menstruation, pregnancy, and the puerperal state.

Objective Symptoms.—Acute Variety.—The symptoms are the same as in acute simple vaginitis except that the local signs of urethritis, endometritis, and vulvitis are added. As in the non-specific variety, the inflammation may involve the entire surface of the vagina or it may occur in patches separated from each other by healthy mucous membrane. When the infection starts in the urethra or vulva, the lower part of the vagina is usually affected; but when the disease begins in the cervical canal, the inflammation is generally limited to the posterior vaginal culdesac.

Chronic Variety.—The symptoms are the same as in chronic simple vaginitis except that the disease has a stronger tendency to become latent.

Diagnosis.—Differential Diagnosis.—See simple vaginitis, page 269.

Prognosis.—The prognosis must always be guarded on account of the tendency of the infection to spread and become latent. The course of the inflammation is also influenced by the variety of the disease and the promptness with which the treatment is instituted. An acute primary infection which is at once placed under treatment is usually cured in from two to three weeks without involving any of the neighboring organs. But, unfortunately, in the chronic form the uterus is usually infected before the patient seeks relief, as the vaginal symptoms are, as a rule, so insignificant that they cause but little or no inconvenience. The prognosis in cases of secondary infection depends upon the situation and extent of the primary involvement.

Treatment.—The treatment is the same as in simple vaginitis (see page 270).

The patient should not be pronounced cured until the gonococci are shown to be absent by repeated microscopic and bacteriologic examinations of the discharge.

Granular Vaginitis.

Synonym.—Papillary vaginitis.

Description.—This is the most frequent form of vaginitis. As the result of inflammation or congestion the papillæ of the vagina become infiltrated and the mucous membrane assumes a granular appearance. The granulations are hemispheric in shape, small in size, and are profusely scattered over the mucosa of the vagina and cervix, and in rare instances they extend also to the mucous membrane of the external organs of generation.

Causes.—The affection may result from simple or gonorrheal vaginitis and from the congestion of pregnancy.

Symptoms.—The *subjective symptoms* are usually subacute in character. The vagina is tender, there is a feeling of fullness in the pelvis and a mucopurulent discharge. Pruritus vulvæ is a more or less constant symptom and the external organs are occasionally the seat of an eczematous eruption.

The *objective symptoms* are characterized by the presence of small granulations scattered over the vagina and the cervix.

Diagnosis.—The patient should be placed in the knee-chest position and the vaginal canal exposed with Simon's speculum. The presence of the granulations confirms the diagnosis.

Prognosis.—The disease generally yields readily to treatment, and when the affection is due to pregnancy it often spontaneously disappears at the end of gestation.

Treatment.—**Rest.**—If the disease occurs during pregnancy, it is advisable for the patient to assume the recumbent posture two or three times daily, for ten or fifteen minutes, to relieve the pressure of the pregnant uterus on the pelvic organs. Ordinarily, however, this is not necessary, and the patient should be out every day in the open air and sunshine.

Bowels.—The bowels should be kept regular with a mild laxative and the occasional use of a saline.

Diet.—An easily digested and nourishing diet should be given.

Cleanliness and Local Medication.—The vagina is douched once a day with a gallon of hot normal salt solution followed by two quarts of corrosive sublimate (1 to 4000), and a tampon of cotton-wool, saturated with an aqueous solution of argyrol (25 per cent.), boroglycerid, or glycerite of tannic acid (20 per cent.), is then introduced and allowed to remain for twenty-four hours.

Variations in the Treatment.—In some cases it is necessary in addition to the above treatment to paint the granulations with nitrate of silver (gr. xxx to f℥j), and sometimes good results are also obtained by substituting dry astringent tampons for the glycerin combinations (see variations in the treatment of simple vaginitis, p. 271). And, finally, the direct application of sulphate of copper (gr. xx–xxx to f℥j) often hastens the disappearance of the granulations and cures the disease.

Senile Vaginitis.

Synonym.—Adhesive vaginitis.

Definition.—An inflammation of the vagina occurring in women who have passed the menopause which is characterized by the formation of adhesions.

Causes.—The disease is due to the atrophic changes of old age which result in defective nutrition and loss of epithelium. Eventually those portions of the mucous membrane which have had their resisting power thus weakened or destroyed become infected and the local conditions peculiar to this form of vaginitis manifest themselves. The disease is essentially one of old age, and it occurs so frequently that most women after sixty suffer more or less from it.

Symptoms.—The *subjective symptoms* are not in any way characteristic and all the patient usually complains of is a thin, serous, leukorrheal discharge which is not profuse or constant and which is at times streaked with blood. In some cases there may be a burning sensation in the vagina, a feeling of weight in the pelvis, and a distressing irritation of the external organs of generation. Sexual intercourse is either impossible or very painful.

The *objective symptoms*, on the other hand, are marked. The mucous membrane is found to be smooth, atrophied, and covered with a scanty serous

secretion, while various sized spots of ecchymosis and superficial ulceration are observed scattered over its surface. Adhesions resulting from contact between the ulcerated surfaces are common, and in some cases the vaginal vault as well as other parts of the canal may be obliterated or greatly distorted.

Diagnosis.—The examination should be made with the patient in the dorsal posture, and care must be exercised not to injure the parts during the necessary manipulations. The adhesions can readily be detected with the finger, and it may not always be necessary to introduce a speculum, as the characteristic lesions of ecchymosis and ulceration can often be seen in the lower part of the vagina by separating the labia.

Prognosis.—When the adhesions are recent, they may sometimes be separated and the normal shape of the canal restored; but unfortunately this is generally impossible, and radical measures are therefore out of the question. As the disease is caused by changes which are incident to old age, a permanent cure cannot be looked for in the majority of cases.

Treatment.—When the affection is not accompanied by annoying symptoms, there are no indications for treatment, and the interests of the patient are best subserved by doing nothing. If, however, the subjective symptoms are marked, the indications are to cure the ulcerations, to prevent adhesions, and to allay the subacute inflammatory condition which is present.

The treatment is purely local, as follows: The vagina is douched every twenty-four hours with a gallon of hot normal salt solution and two quarts of corrosive sublimate (1 to 6000). The antiseptic is then washed out with a quart of the salt solution and a cotton-wool tampon saturated with boroglycerid is introduced into the vagina. The spots of superficial ulceration are painted with a solution of nitrate of silver (gr. xxx to f℥j) twice a week.

Variations in the Treatment.—Ointments spread upon a tampon and applied to the vagina often give marked relief. Thus, good results have followed the use of cold-cream or vaselin, alone or combined with equal parts of lanolin, and benzoated oxid of zinc ointment. The efficacy of these preparations may be increased by the addition of 3 per cent. of carbolic acid. Warm injections of creolin or lysol (1 per cent.) are often grateful to the patient and soothing to the vagina, and should be remembered as valuable adjuncts in the treatment.

The question of the management of adhesions may at times present itself. In my judgment, old adhesions should be let alone unless they prevent the exit of discharges. Recent cases, however, are readily broken up with the fingers and kept separated with a medicated tampon until the raw surfaces heal.

Emphysematous Vaginitis.

Synonym.—Colpohyperplasia cystica.

Definition.—An inflammation of the vagina which occurs chiefly in pregnant women and is characterized by the formation of small cysts filled with gas.

Causes.—The affection usually occurs in pregnancy and it has also been observed in the non-pregnant state.

Symptoms.—The *subjective symptoms* are not characteristic. The patient complains of a slight leukorrhea and tenderness of the vagina to touch.

The *objective signs* are readily recognized. The lesion consists of a number of small cysts situated on an inflamed and somewhat swollen base. These little vesicles are filled with gas and collapse at once when they are punctured. They may break spontaneously and leave a small superficial ulcer, or they may gradually disappear by a process of desquamation. They are usually seen in groups

in the upper part of the vagina, but they may also at times extend over the entire surface of the canal, and in some cases even the cervix is involved.

Prognosis.—When the disease occurs during pregnancy, it disappears spontaneously within two or three months after labor. The prognosis in non-pregnant women is good, as the disease yields readily to treatment.

Treatment.—No treatment is indicated when the affection occurs during pregnancy. In other cases good results are obtained by giving a daily injection of a gallon of hot normal salt solution and two quarts of corrosive sublimate (1 to 4000). The antiseptic is then washed out with a quart of the salt solution and a cotton-wool tampon saturated with glycerite of tannic acid (20 per cent.) introduced into the vagina.

When superficial ulcerations occur, they should be painted twice a week with nitrate of silver (gr. xxx to f℥j).

CYSTS.

Origin.—In the majority of instances cysts of the vagina are probably embryonic in origin and are caused by the accumulation of fluid in the remains of the Wolffian canal or in the ducts of Gärtner or Müller. According to some authorities, they may be retention cysts of the vaginal glands. Pozzi, however, believes that these glands do not exist, but that "they may be simulated by crypts or lacunæ which, by obliteration of their orifices, may play the same pathologic rôle." In some cases, as the result of traumatism, a hematoma forms in the vaginal wall which may become encapsulated and give rise to a blood-cyst, or, if the serum is not absorbed, a hygroma containing a clear, serous fluid develops. Again, vaginal cysts may be due to dilatation of the lymphatic vessels; and, finally, both hydatid and dermoid cysts have been met in the vagina.

Vaginal cysts usually occur in the adult, but no age is exempt, and they have been observed in the new-born child.

Description.—While vaginal cysts are not common, they are, however, the most frequent form of neoplasm met in that situation, and, as a rule, they are found in the anterior or posterior wall, although in exceptional cases they may grow from any part of the canal. According to some observers, they are found most frequently in the upper part of the vagina, while others again are of the opinion that the majority of cysts occur in the lower portion. Cysts of the vagina occur singly, as a rule, but in very rare instances several may be found arranged in a row or in groups. This is especially characteristic of cysts developed from the Wolffian canal. The growth of vaginal cysts is very slow and they may take years to develop, but there are, however, exceptions to this rule, as cases are occasionally met where the development is rapid. About one-half of all vaginal cysts are the size of a pigeon's egg; the remainder vary, however, between the extreme limits of a small pea and a new-born child's head.

A vaginal cyst is round and circumscribed, but it may become pear-shaped and have a more or less distinct pedicle. If the mucous membrane of the vagina is normal, it moves freely over the surface of the tumor; but if it becomes atrophied from distention or pressure, or the cyst becomes inflamed, adhesions occur and the mobility of the mucosa is destroyed. The walls of a large cyst are usually thin and almost transparent. The folds and rugæ of the vagina are destroyed, and the surface is smooth and shining from atrophy and distention. The contents of the cyst vary in character, although usually the fluid is clear, thin, and transparent, and of a light yellowish hue, or it may be thick and tenacious. Sometimes it is dark chocolate in color from the presence of disorganized blood, or, again, it may contain granular epithelium, pus, or fat cells and crystals of cholesterin.

Symptoms.—The character of the symptoms depends upon the size and situation of the cyst. A very small tumor usually causes no trouble, but when it has attained a considerable size certain phenomena arise which result from its presence. Thus, it may interfere with voiding urine by pressing upon the urethra; it may cause frequent urination by lessening the capacity of the bladder; or it may deflect the stream of urine into the vagina. The pressure upon the rectum causes constipation and hemorrhoids, and there is a feeling of weight or dragging in the pelvis due to traction upon the upper part of the vagina. The pelvic symptoms are all increased in severity when the woman strains or stands erect. Again, the mechanic obstruction offered to the entrance of the penis makes sexual intercourse difficult or impossible. And, finally, it may act as an obstacle in labor; it may cause leukorrhea or a profuse fetid discharge by irritating the vagina or preventing the free escape of the normal discharges; or it may interfere with walking and sitting, especially when the growth protrudes beyond the vaginal entrance.

Diagnosis.—The diagnosis, as a rule, is not difficult, and is based upon the situation of the tumor and its physical characteristics.

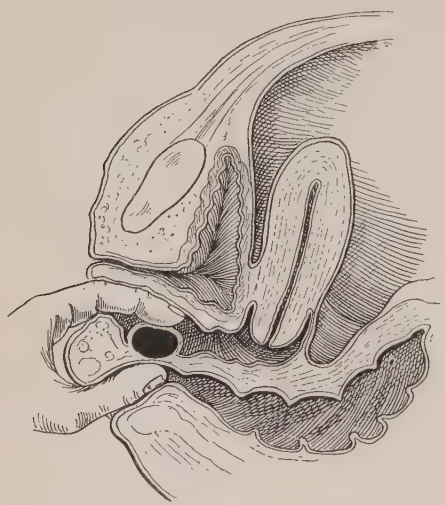


Fig. 270.

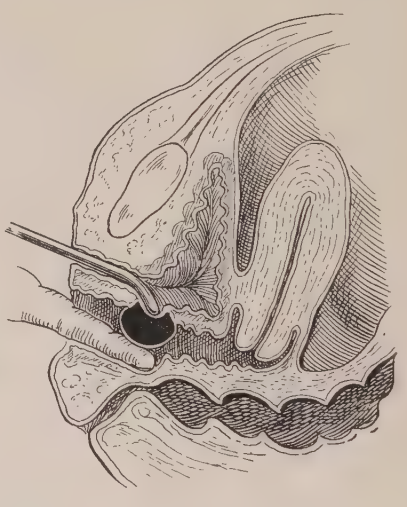


Fig. 271.

Diagnosis of a Cyst of the Vagina.

Fig. 270 shows a cyst in the posterior wall of the vagina; Fig. 271 shows a cyst in the anterior wall of the vagina.

An effort must first be made to prove that the tumor grows from the vaginal wall. This is accomplished by grasping the enlargement with the fingers and making traction upon it in various directions, when the sense of touch will at once demonstrate its connections. If the cyst is on the posterior wall, we must also use the combined rectal and vaginal touch; but if it is on the anterior wall, a sound should be passed into the bladder and counter-pressure made through the vagina with the index-finger of the left hand.

If the cyst is situated in the upper part of the vagina near the cervix, the examination must be made under an anesthetic and the tumor carefully palpated between the index-finger of the left hand in the vagina and the fingers of the right hand making counter-pressure downward through the abdominal wall just above the symphysis pubis (*vagino-abdominal touch*).

The tumor is tense, elastic, and usually circumscribed. Fluctuation is generally present in a large cyst and may be demonstrated by grasping the tumor between the thumb and the index and middle fingers or by rectovaginal and vagino-abdominal touch. The vaginal mucous membrane moves freely over the surface of the cyst unless it is adherent from overdistention or inflammation. The vaginal mucosa is normal in small cysts, but in large ones it is smooth and shining, without folds or rugæ, and of a darker color than the surrounding tissues. The size of the tumor is not affected by bearing-down or the position of the patient, and distention of the bladder does not increase the tension of the tissues.

Differential Diagnosis.—A vaginal cyst must be distinguished from a cystocele, a rectocele, a urethrocele, a vaginal hernia, a mass in the pelvic cavity, and a collection of menstrual blood or pus in the culdesac of a double vagina.

A cystocele is always situated in the anterior wall of the vagina; it is increased in size and tension upon coughing or straining; it disappears on pressure; it is tense and elastic when the bladder is full; and only the vaginal and bladder walls intervene between the finger in the vagina and a sound in the bladder.

A rectocele is always situated in the posterior wall of the vagina; it is increased in size and tension upon coughing or straining; it disappears on pressure; and only the rectal and vaginal walls intervene between the index-finger in the rectum and the thumb in the vagina.

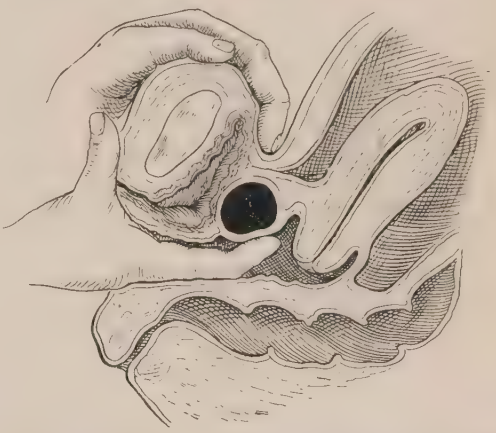


Fig. 272.—Diagnosis of a Cyst in the Upper Part of the Vagina.

A urethrocele is always situated at a point in the vaginal wall which corresponds to the middle third of the urethra; it is not affected by straining or bearing-down; it disappears on pressure which causes a few drops of urine to escape from the meatus; and only the urethral and vaginal walls intervene between the finger in the vagina and the tip of a sound passed into the sac through the urethra.

A vaginal hernia is always situated in the anterior or posterior wall of the vagina; it is increased in size and tension upon coughing or straining; it disappears on pressure with a gurgling sound; it is soft and doughy to the touch; and the thickness of the intervening structures is found to be increased by the intestine when a rectovaginal or a vesicovaginal examination is made.

A mass in the pelvis caused by a lesion of one of the pelvic organs may be mistaken for a cyst of the vaginal wall, especially when the tumor contains fluid. It is not difficult, however, under the influence of an anesthetic to demonstrate by rectovaginal and vagino-abdominal examinations that the wall of the vagina has no connection with the enlargement and that the mass is situated in the pelvic cavity.

In cases of double vagina where the cervix is also bifurcated the auxiliary organ may end in a culdesac in which the menstrual blood accumulates after puberty and forms a cystic tumor. The differential diagnosis between this condition and a cyst of the vagina cannot be made until the parts are exposed and the malformations revealed at the time of operation.

Results and Prognosis.—A large cyst situated at the upper part of the vagina is apt to drag the uterus down or push it forward, backward, or laterally. Vaginitis is often caused from the irritation produced by the presence of the growth; by the retention of the normal secretions; and by the deflection of the stream of urine into the vagina. Inflammation followed by suppuration and gangrene has also been observed as the result of traumatisms, especially those occurring in labor. Rupture may occur spontaneously as the result of injury or

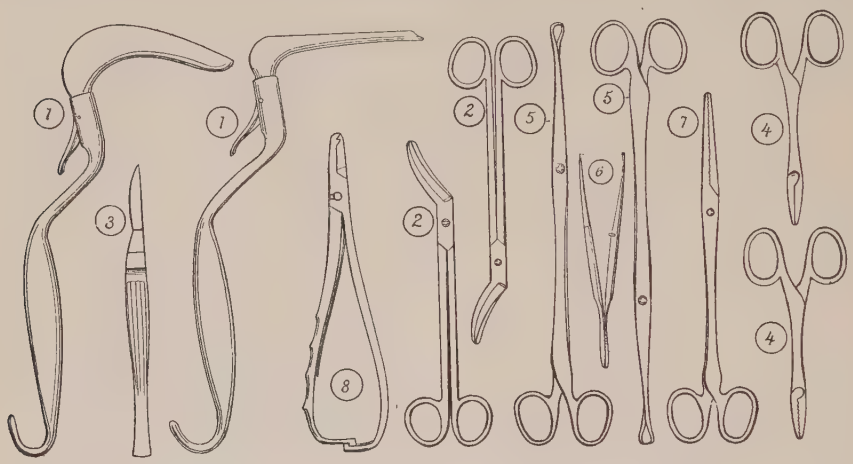


FIG. 273.—INSTRUMENTS USED IN THE OPERATION FOR THE PARTIAL REMOVAL OF A VAGINAL CYST (page 279).

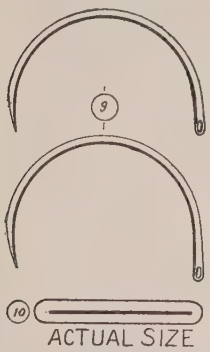


FIG. 274.—NEEDLES AND SUTURE MATERIAL USED IN THE OPERATION FOR PARTIAL REMOVAL OF A VAGINAL CYST (page 279).

suppuration, and unless the secreting portion of the sac is destroyed the cyst refills.

Vaginal cysts, as a rule, grow slowly, or may even cease to develop altogether and remain quiescent for a long time. They cause no danger to life unless infection occurs, and in many instances the woman is unaware of their presence. Operative measures are always followed by a cure.

Treatment.—The treatment is operative and consists in (1) partial removal of the sac, and (2) complete removal of the sac.

Other forms of treatment are dangerous and useless. Thus, puncture followed by the injection of iodin or carbolic acid into the sac to bring about an adhesive inflammation often fails to cure and at the same time endangers the life of the patient from septic infection. A simple incision is never followed by good results and should not be employed as the sac always refills.

Partial Removal of the Sac.—This operation is always indicated except when the cyst is very small and situated near the vaginal entrance. There is great danger from complete extirpation in wounding the bladder, the ureters, the rectum, or the peritoneum, and, in addition, a serious hemorrhage may result from the extensive dissection required.

Technic of the Operation.—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 830 and 831.

Position of the Patient.—Dorsal position.

Number of Assistants.—An anesthetizer, two assistants, and one general nurse.

Instruments.—(1) Simon's speculums (curved and flat blades); (2) right and left Emmet's slightly curved scissors; (3) scalpel; (4) two short hemostatic forceps; (5) two bullet forceps; (6) tissue forceps; (7) dressing forceps; (8) needle-holder; (9) two small full-curved Hagedorn needles; (10) plain cumol catgut—No. 2, four envelopes (Figs. 273 and 274).

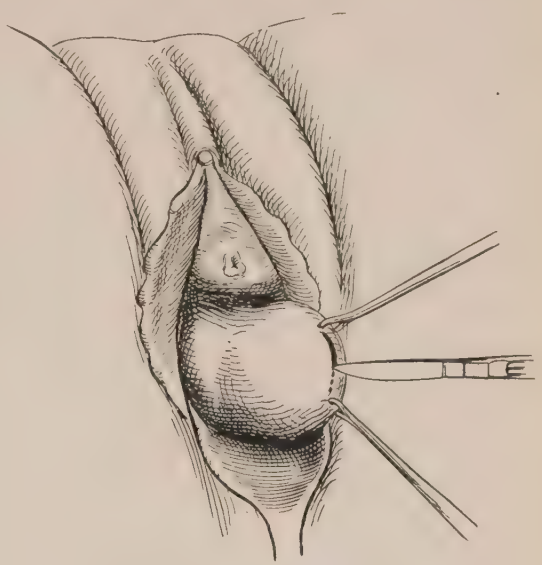


FIG. 275.—OPERATION FOR THE PARTIAL REMOVAL OF A VAGINAL CYST—First Step.

Operation. — FIRST STEP.—The speculum is introduced into the vagina and the cyst exposed to view. The apex of the cyst is then seized with bullet forceps, which are placed about half an inch apart, and an opening made with a scalpel into the sac between the instruments. The index-finger is then passed into the cyst and its connections ascertained.

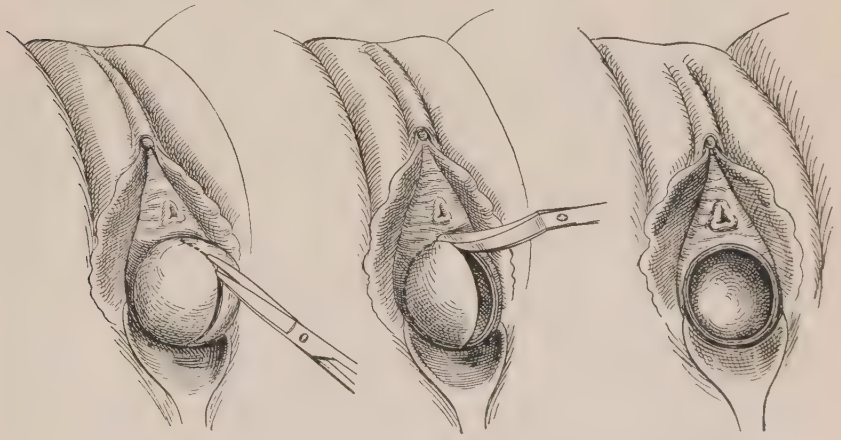


FIG. 276. FIG. 277. FIG. 278.

OPERATION FOR THE PARTIAL REMOVAL OF A VAGINAL CYST—Second Step.

Fig. 276 shows the incision being enlarged down to the level of the vaginal wall; Fig. 277 shows the superficial portion of the cyst being cut off close to the vaginal wall; Fig. 278 shows the superficial portion of the cyst removed and the bottom of the sac exposed.

SECOND STEP.—The opening into the cyst is enlarged in opposite directions with scissors down to the level of the vaginal wall and the two halves cut off close

to the vagina with the right and left curved scissors, leaving the bottom of the sac in place.

In cutting away the anterior portion of the cyst traction should not be made upon the tissues or too much of the vaginal mucous membrane will be removed and an extensive raw surface left which may be a long time in healing and eventually cause a serious stricture.

THIRD STEP.—The raw edges of the vaginal mucous membrane and the wall of the cyst are approximated and united by interrupted catgut sutures.

FOURTH STEP.—The vagina is irrigated with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and dried with a gauze sponge. The cavity of the cyst and the vagina are then packed with a strip of iodoform gauze and the vulva protected with a compress secured by a T-bandage.

Variations in the Technic.—Some operators do not consider it necessary to unite the edges of the vaginal mucosa to the cyst wall with sutures, but I believe, however, that it is always best to do so, as there is more or less retraction of the mucous membrane, which leaves a raw surface and delays the healing of the wound. Again, sutures control the bleeding, which may be considerable at times, and furthermore there is less danger of infection when union occurs by first intention than when the edges are allowed to heal by granulation; in either case the cyst wall is spontaneously exfoliated in a short time.

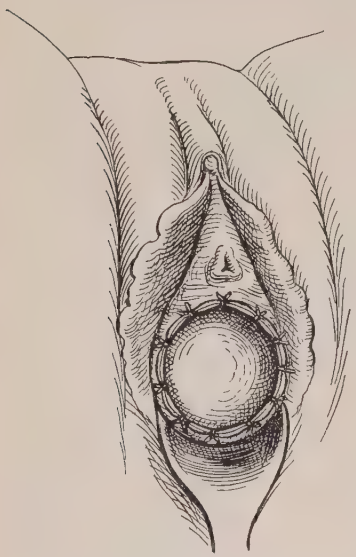


FIG. 279.—OPERATION FOR THE PARTIAL REMOVAL OF A VAGINAL CYST—Third Step.

In suppurating cysts there are two points of difference in the operative technic which must be borne in mind. *First*, the mucosa and the edges of the cyst wall should not be united by sutures, because the parts are infected, and unless the drainage is free there is likely to be an extensive burrowing of pus into the loose connective tissue; and, *second*, after the anterior portion of the cyst wall is cut away the undisturbed part of the sac is cureted with a sharp curet and pure carbolic acid applied.

If an embryonic vaginal cyst communicates with a cystic tumor of the parovarium, the technic is the same as in an ordinary cyst except that the prolongation of the cystic cavity is packed with a narrow strip of iodoform gauze which is removed and reintroduced daily until contraction and closure take place.

After-treatment.—*Care of the Wound.*—The compress is temporarily removed when the bowels and bladder are evacuated. The gauze packing is taken out in forty-eight hours and reapplied daily until the wound is entirely healed. Before packing the vagina it is irrigated with a pint of corrosive sublimate solution (1 to 2000), followed by a quart of hot normal salt solution, and carefully dried with small gauze sponges. The irrigation is continued until the wound is entirely healed, and then a daily douche of a gallon of hot normal salt solution is given for several weeks.

The Bladder.—The urine must be voided either spontaneously or with a catheter every eight hours.

The Bowels.—The bowels should be moved in twenty-four hours and then opened regularly once a day.

The Diet.—The diet is regulated as follows: During the first forty-eight hours liquid diet (see p. 106); then soft diet (see p. 111) until the end of the week; and, finally, convalescent diet (see p. 114).

Restlessness; Pain.—As a rule, there is no occasion for the use of drugs. If necessary, a hypodermic injection of morphin (gr. $\frac{1}{8}$) may be used during the first twenty-four hours, and if the patient is restless at night or does not sleep, sulphonal or trional is administered.

Getting Out of Bed.—The patient should remain in bed until the wound is entirely healed.

Complete Removal of the Sac.—This operation is seldom indicated and must be confined to very small cysts situated near the vulvovaginal orifice.

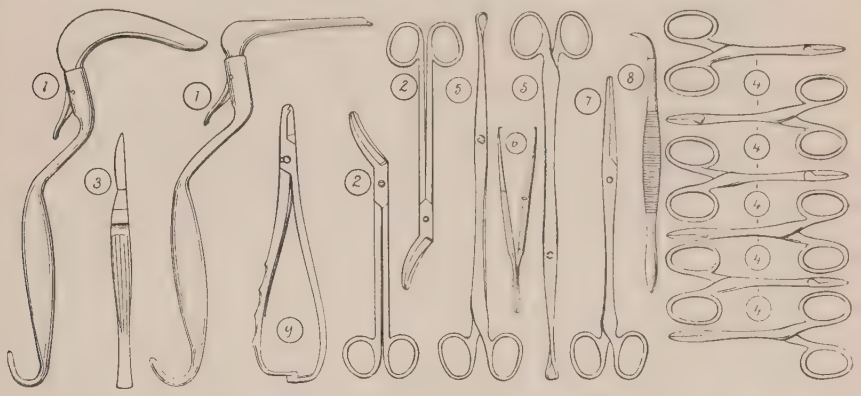


FIG. 280.—INSTRUMENTS USED IN THE OPERATION FOR THE COMPLETE REMOVAL OF A VAGINAL CYST.

Technic of the Operation.—The *Preparation of the Patient*, the *Preparations for the Operation*, the *Position of the Patient*, and the *Number of Assistants* are the same as in the operation of partial removal of the sac.

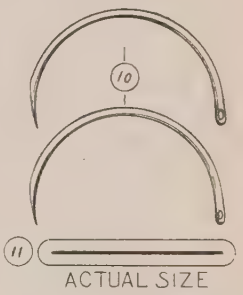


FIG. 281.—NEEDLES AND SUTURE MATERIAL USED IN THE OPERATION FOR THE COMPLETE REMOVAL OF A VAGINAL CYST.

Instruments.—(1) Simon's speculums (curved and flat blades); (2) right and left Emmet's slightly curved scissors; (3) scalpel; (4) six short hemostatic forceps; (5) two bullet forceps; (6) tissue forceps; (7) dressing forceps; (8) dry dissector; (9) needle-holder; (10) two small full-curved Hagedorn needles; (11) plain cumol catgut—No. 2, four envelopes.

Operation.—FIRST STEP.—The speculum is introduced into the vagina and the cyst exposed to view. The apex of the cyst is then seized with bullet forceps, which are placed about one inch apart, and an incision made through the mucous membrane down to but not through the cyst wall (Fig. 282).

SECOND STEP.—The cyst is enucleated by separating it from the surrounding tissues with the finger and dry dissector, care being taken not to rupture the sac (Fig. 283).

THIRD STEP.—The redundant portion of the vaginal mucous membrane is

cut away with the right and left curved scissors and the wound closed with deep interrupted catgut sutures.

Fourth Step.—The vagina is irrigated with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and dried with a gauze sponge.

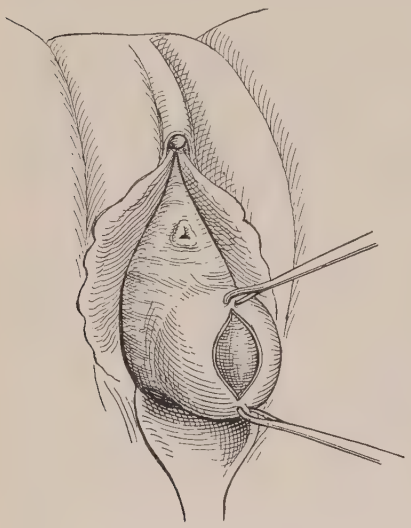


Fig. 282.—First Step.

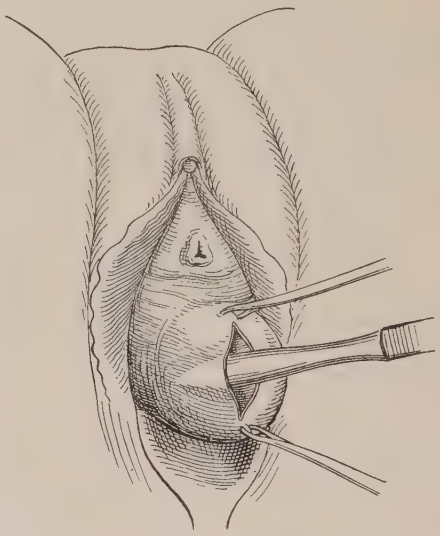


Fig. 283.—Second Step.

Operation for the Complete Removal of a Vaginal Cyst (page 281).

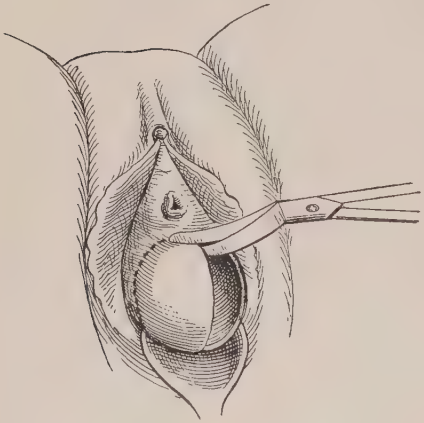


Fig. 284.

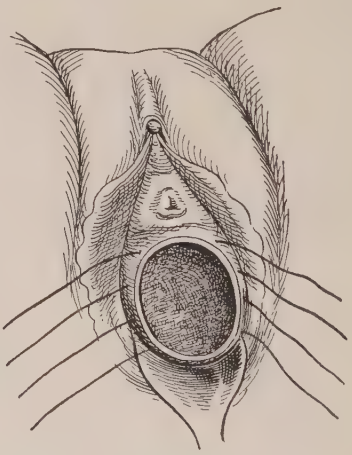


Fig. 285.

Operation for the Complete Removal of a Vaginal Cyst.—Third Step.

Fig. 284 shows the redundant portion of the vaginal wall being removed; Fig. 285 shows the sutures in place.

It is then packed with a strip of plain gauze and the vulva protected with a compress secured by a T-bandage.

Variations in the Technic.—If the cyst ruptures, it is very difficult or even impossible in some cases to remove the sac completely. To

guard against this danger Pozzi recommends the following method: "The cyst is first punctured with a trocar, washed out with hot water, and melted paraffin introduced at a low temperature. When the cavity is distended, ice is applied and at the end of a few minutes we obtain a mass which is very easily extirpated."

After-treatment.—*Care of the Wound.*—The compress is temporarily removed when the bowels and bladder are evacuated. The gauze packing is taken out in forty-eight hours and not introduced again. The vagina is then irrigated daily with a corrosive sublimate solution (1 to 2000), followed by a quart of hot normal salt solution. The douches are continued until the patient gets out of bed, and a daily irrigation of hot normal salt solution is then given for several weeks.

The *care of the bowels* and *the bladder*, the *regulation of the diet*, and the *relief of restlessness and pain* are discussed under the after-treatment of partial removal of the sac on page 280.

Getting Out of Bed.—The patient should remain in bed for ten days.

FIBROMATA.

Description.—The connective tissue and muscular tumors are the most infrequent of the neoplasms of the vagina. These growths generally occur as myofibromata or fibromyomata; a tumor made up of fibrous or muscular tissue alone is exceedingly rare. As a rule, these growths are situated in the upper part of the anterior vaginal wall, but they have also been observed upon the posterior and in very rare instances upon the lateral walls. A fibrous tumor always occurs singly and is of slow growth, requiring several years, as a rule, to attain a large size. It is seldom bigger than a man's fist and ranges in size from a small bean to a child's head. At first it is round, with a broad or sessile base, but as the tumor increases in size and weight it drags upon the vagina and forms a more or less distinct pedicle (*fibroid polyp*). Sometimes its shape is changed by the pressure of the vaginal walls and the growth becomes oblong.

Causes.—The cause is unknown. They are most often met during the child-bearing period of a woman's life, but no age is exempt, and they have been found in all ages and as congenital tumors in young infants.

Symptoms.—The character of the symptoms depends upon the size and situation of the tumor. A small growth causes no inconvenience to the patient and is usually discovered by accident. A large fibroid, on the other hand, may press upon the urethra or bladder and act either as an obstruction to urination or cause vesical tenesmus. When the neoplasm is situated in the posterior vaginal wall and protrudes beyond the orifice of the vagina, it may deflect the stream of urine and cause great annoyance to the patient. The pressure which the tumor exerts upon the rectum causes constipation and hemorrhoids, and the traction of the growth upon the vagina when the patient is erect produces a feeling of weight or dragging in the pelvis. Large tumors interfere with walking and sitting; they act as an obstruction to coitus and labor; they cause leukorrhea, or a profuse fetid discharge; and, finally, hemorrhages may occur if the surface of the tumor becomes ulcerated.

Diagnosis.—The diagnosis is based upon the situation and the physical characteristics of the tumor.

An effort must first be made to prove that the tumor grows from the vaginal walls. This is accomplished by direct palpation and vesicovaginal, rectovaginal, or vagino-abdominal touch. (See Diagnosis of Vaginal Cysts, p. 276.)

The tumor is either hard or soft in consistency and circumscribed. The degree of hardness depends upon the relative amount of fibrous or muscular

tissue forming the growth. The vaginal mucosa moves freely over the surface of the neoplasm unless adhesions have formed from overdistention or inflammation. The mucous membrane is normal in small growths, but in large ones it becomes smooth and shining. The size of the tumor is not affected by straining or the position of the patient, and a large amount of urine in the bladder does not increase the tension of the mucous membrane.

Differential Diagnosis.—Fibrous tumors must be distinguished from a cystocele, a rectocele, a mass in the pelvic cavity, and a malignant growth.

A cystocele is always situated on the anterior wall of the vagina; it is increased in size and tension upon coughing or straining; it disappears on pressure; it is tense and elastic when the bladder is full; and only the bladder and vaginal walls intervene between the finger in the vagina and a sound in the bladder.

A rectocele is always situated on the posterior wall of the vagina; it is increased in size and tension upon coughing or straining; it disappears on pressure; and only the rectal and vaginal walls intervene between the index-finger in the rectum and the thumb in the vagina.

A mass in the pelvis caused by a lesion of one of the pelvic organs is differentiated from a vaginal tumor by demonstrating that the wall of the vagina has no connection with it. This is easily accomplished by making a rectovaginal and a vagino-abdominal examination under the influence of an anesthetic.

The slow growth, the absence of infiltration, and the regular outlines of the enlargement make it easy to distinguish a fibroid tumor from malignant neoplasms. When, however, a fibroma becomes inflamed, edematous, or ulcerated, the diagnosis is difficult and can only be made with certainty by the microscope.

Results and Prognosis.—A large tumor is apt to displace the vagina and pelvic organs. Vaginitis may also result from the irritation of the growth, the retention of normal secretions, and the deflection of urine into the vagina. Inflammation, suppuration, and gangrene may occur and severe hemorrhages take place from the sloughing mass, or the tumor may become separated from the vagina and be expelled spontaneously. Calcareous and myxomatous degenerations have been observed and malignant changes have taken place in these tumors. A fibrous tumor may become edematous and be mistaken for a cystic growth or an abscess on account of its soft fluctuating character.

The prognosis is favorable unless infection occurs or the tumor acts as an obstruction in labor. Fibroid tumors do not return after being removed.

Treatment.—The treatment is operative and consists in the removal of the tumor.

Sessile Tumors.—Tumors having a broad or sessile base are removed by complete enucleation.

Technic of the Operation.—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 830 and 831.

Position of the Patient.—Dorsal position.

Number of Assistants.—An anesthetizer, two assistants, and a general nurse.

Instruments.—(See complete removal of a vaginal cyst, Figs. 280 and 281.) (1) Simon's speculums (curved and flat blades); (2) right and left Emmet's slightly curved scissors; (3) scalpel; (4) six short hemostatic forceps; (5) two bullet forceps; (6) tissue forceps; (7) dressing forceps; (8) dry dissector; (9) needle-holder; (10) two small full-curved Hagedorn needles; (11) plain cumol catgut—No. 2, four envelopes.

Operation.—First Step.—(See complete removal of a vaginal cyst, Fig. 282.) The speculums are introduced into the vagina and the tumor exposed to view. It is then seized with bullet forceps and a free incision made through the vaginal mucous membrane.

Second Step.—(See complete removal of a vaginal cyst, Fig. 283.) The growth is enucleated by separating it from the surrounding tissues with the dry dissector and the fingers.

Third Step.—(See complete removal of a vaginal cyst, Figs. 284 and 285.) The redundant portion of the vaginal mucous membrane is cut away with the right and left curved scissors and the wound closed with deep interrupted catgut sutures.

Fourth Step.—The vagina is irrigated with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and dried with a gauze sponge.

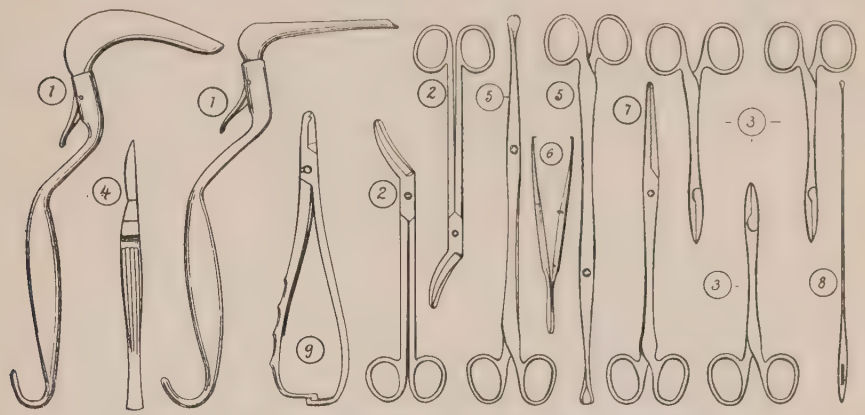


Fig. 286.—Instruments Used in the Operation for the Removal of a Pedunculated Tumor of the Vagina (page 286).

It is then packed with gauze and the vulva protected with a compress secured by a T-bandage.

Special Directions.—The intimate connection existing in some cases between the tumor and the bladder, the rectum, or the peritoneum makes it necessary to use the greatest care during the enucleation of the growth to prevent injuring either of these organs. Should such an accident happen, the false opening is united with buried catgut sutures and the rest of the wound closed in the usual way.

Hemorrhage is controlled with hemostatic forceps during the operation, and before the wound is closed the vessels which continue to bleed are ligated with catgut.

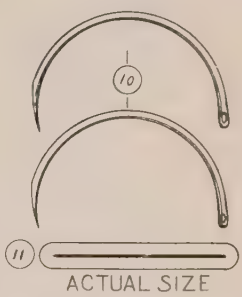


Fig. 287.—Needles and Suture Material Used in the Operation for the Removal of a Pedunculated Tumor of the Vagina (page 286).

After-treatment.—*Care of the Wound.*—The vaginal tampon is removed in forty-eight hours and not introduced again. The vagina is then irrigated daily with a solution of corrosive sublimate (1 to 2000), followed by a quart of hot salt solution. The antiseptic douches are continued until the patient gets out of bed and a daily injection of hot salt solution is then given for several weeks.

The Bladder.—The urine should be voided spontaneously or drawn with a catheter every eight hours.

The Bowels.—The bowels should be moved at the end of twenty-four hours and then opened regularly every day.

The Diet.—During the first forty-eight hours a liquid diet (see p. 106) should

be given; then a soft diet (see p. 111) until the end of the week; and, finally, the patient is placed upon a convalescent diet (see p. 114).

Restlessness and Pain.—If necessary, a hypodermic injection of morphin (gr. $\frac{1}{8}$) may be given during the first twenty-four hours, and if the patient is restless or does not sleep sulphonal or trional is administered.

Getting Out of Bed.—The patient should remain in bed for ten days unless one of the adjacent organs has been injured, in which case the time should be extended to at least two weeks.

Pedunculated Tumors.—Tumors having a pedicle are removed by cutting them away on a level with the wall of the vagina and uniting the raw surfaces with sutures.

Technic of the Operation.—The *Preparation of the Patient*, the *Preparations for the Operation*, the *Position of the Patient*, and the *Number of Assistants* are the same as in operations upon sessile tumors.

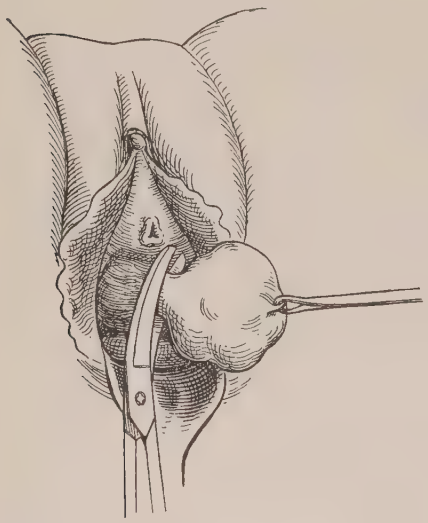


FIG. 288.—First Step.

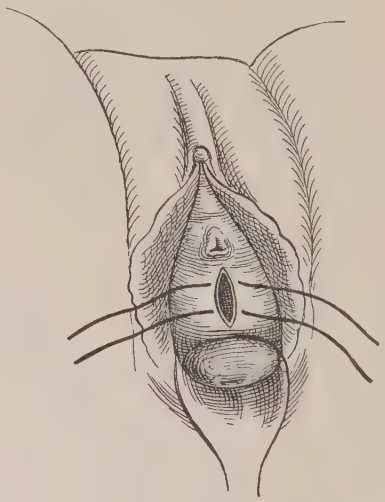


FIG. 289.—Second Step.

OPERATION FOR THE REMOVAL OF A PEDUNCULATED TUMOR OF THE VAGINA.

Instruments.—(1) Simon's speculums (curved and flat blades); (2) right and left Emmet's slightly curved scissors; (3) three short hemostatic forceps; (4) scalpel; (5) two bullet forceps; (6) tissue forceps; (7) dressing forceps; (8) long silver probe; (9) needle-holder; (10) two small full-curved Hagedorn needles; (11) plain cumol catgut—No. 2, four envelopes.

Operation.—FIRST STEP.—The speculums are introduced into the vagina and the parts exposed to view. The tumor is then seized with bullet forceps, and while slight traction is being made the pedicle is divided close to the vaginal wall.

SECOND STEP.—The edges of the wound are brought together and united with interrupted catgut sutures.

THIRD STEP.—The vagina is douched with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and dried with a gauze sponge.

It is then packed with gauze and the vulva protected with a compress secured by a T-bandage.

Variations in the Technic.—In large tumors with thick pedicles a prolongation of the rectum or bladder is occasionally found in the constricted portion of the neoplasm. This is probably due to an abnormal connection originally formed with the tumor, which later on became pedunculated and dragged the adherent bladder or rectal wall with it. In these cases a careful examination must be made before cutting through the pedicle by introducing

Fig. 290.—Operation for the Removal of a Pedunculated Tumor of the Vagina. Showing the presence of a prolongation of the rectal wall into the pedicle of a vaginal tumor by means of a sound.

a long silver probe into the bladder or rectum and exploring the connections of the tumor.

After-treatment.—The *care of the wound*, the *bladder*, and the *bowels*, the *regulation of the diet*, and the *relief of restlessness or pain* are discussed under the after-treatment of the operation for the removal of a sessile tumor on page 285.

Getting Out of Bed.—The patient should remain in bed for one week unless the pedicle is very thick, in which case the time should be extended to at least ten days.

CANCER.

Causes.—Carcinoma may attack the vagina as a *primary* or *secondary* condition. The former is very seldom met and is even rarer than primary cancer of the vulva. Secondary involvement of the vagina is common and occurs either from direct extension or metastasis. While the most frequent starting-point of the disease is the cervix, it may also begin in the rectum, the bladder, the urethra, or the vulva and extend into the vaginal walls. When metastasis occurs from neighboring or remote organs, the secondary growth is of the same nature as the primary lesion. Metastatic nodules have been

observed in the vagina in cases of primary cancer of the ovary and body of the uterus; in the latter the infection is usually due to an implantation of cancerous tissue.

Nothing is known of the nature of the cause of primary cancer of the vagina. The majority of cases occur in women between thirty and forty years of age, but no period of life is free from liability, as the affection has been met after the menopause and in young children and infants. T. Smith reported a case of malignant disease in an infant fourteen months old; Guersant in a child of three and a half years; and Johannovsky met with a tumor the size of a hen's egg in a child nine years old.

Symptoms.—There are two varieties of cancer which primarily attack the vagina—*epithelial* and *spheroidal celled*. The first variety is the most frequently met and appears as a papillary tumor or excrescence with a broad indurated base which is generally attached to the upper part of the posterior vaginal wall. The second variety may be either *scirrhous* or *encephaloid* in character and occurs as a diffuse infiltration involving a large portion of the vagina. In some cases the growth completely surrounds the vagina and constricts its caliber.

The disease spreads rapidly into the surrounding structures by infiltration and through the lymphatics. The pelvic and inguinal glands soon become invaded. Ulceration begins early and is rapid in its course, and false passages are formed with the rectum or bladder, or both. As a rule, the ureters are not involved until late in the course of the disease, when symptoms of hydronephrosis and uremia may present themselves.

The characteristic symptoms are *hemorrhage* and *discharge*. The hemorrhage, as a rule, is first noticed after sexual intercourse or defecation. In the beginning it is slight, but as the disease progresses it becomes more and more severe, until finally there is a continuous loss of blood and at times free hemorrhages. The discharge is watery in character at first and of an offensive odor, and as the ulceration advances it becomes mixed with blood, pus, fragments of broken-down tissue, sloughs, feces, and urine. The odor in the later stages of the disease is fetid and putrid.

Pain is a more or less constant symptom which may be felt in the pelvis, the rectum, the bladder, or along the sciatic nerves. As a rule, it is not present until the later stages of the disease, and in some cases it may be absent altogether. Pruritus vulvæ is a frequent manifestation of the affection and is caused by the irritating discharge from the vagina. The symptom is often very exacting and weakens the patient from loss of sleep. When cancerous infiltrations are extensive, they interfere with the function of the bladder and rectum and prevent sexual intercourse or act as an obstruction to labor.

The *constitutional symptoms* and the *effect upon the general health* are the same as when the disease occupies other portions of the body.

Diagnosis.—The diagnosis is based upon the symptoms, physical characteristics of the growth, and the microscopic examination.

The hemorrhage, the discharge, the pain, and the pruritus vulvæ are all significant symptoms and point to the nature of the affection.

A malignant papillary growth has a broad indurated base and an ulcerated surface. Even if an ulcer is not present the fixation of the tumor and the surrounding infiltration are characteristic. When a cancerous excrescence occurs as a cauliflower tumor, the induration of its base, the brittle nature of its structures, and the tendency to hemorrhage are suggestive. In the scirrhous or encephaloid variety involvement of the neighboring tissues and early ulceration point to the character of the trouble.

The enlargement of the pelvic and inguinal glands is an important factor in the diagnosis and must not be lost sight of.

Differential Diagnosis.—Cancer of the vagina must be distinguished from ulcerated fibroids, condylomata, and sarcoma. A fibroid grows slowly, there is absence of infiltration in the surrounding tissues, and the tumor is always circumscribed. When, however, the ulceration is extensive and the growth is inflamed or edematous, the diagnosis can only be made with certainty by means of the microscope. In simple condylomata there is but little tendency to bleeding upon touch, the tissues are not friable, and there is absence of infiltration. The diagnosis of sarcoma must be settled by the microscope alone.

Prognosis.—The course of cancer of the vagina is generally very rapid, and death takes place, as a rule, in about the same length of time as when the disease begins in the uterus. The operative prognosis is bad, as the disease invariably returns even after complete removal of the growth. The fact that

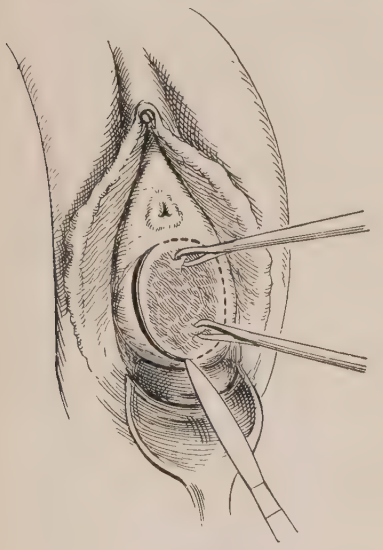


FIG. 291.—First Step.

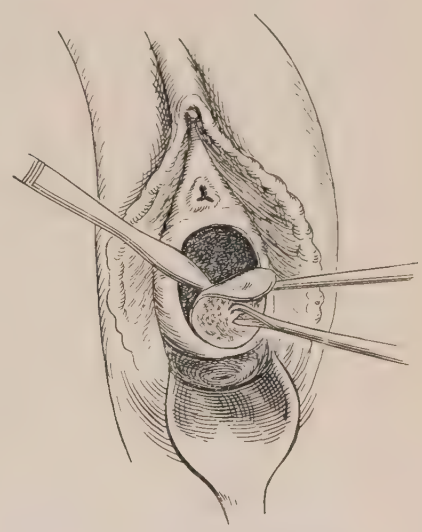


FIG. 292.—Second Step.

OPERATION FOR CANCER OF THE VAGINA (page 290).

so few cases are operated upon early may have something to do with the constant recurrence of the disease. Be that as it may, however, the only hope for the patient is an early recognition of the affection and its thorough extirpation.

Treatment.—The treatment is divided into (1) the radical; (2) the use of the *x*-rays; and (3) the palliative.

Radical Treatment.—The radical treatment is operative and aims to eradicate the disease by (*a*) the removal of the growth and (*b*) the total extirpation of the vagina.

The Removal of the Growth.—This operation is indicated when the tumor is localized and its complete removal is possible.

Technic of the Operation.—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 830 and 831.

Position of the Patient.—Dorsal position.

Number of Assistants.—An anesthetizer, two assistants, and a general nurse are required.

Instruments.—(See p. 281, complete removal of a vaginal cyst.) (1) Simon's speculums (curved and flat blades; (2) right and left Emmet's slightly curved scissors; (3) scalpel; (4) six short hemostatic forceps; (5) two bullet forceps; (6) tissue forceps; (7) dressing forceps; (8) dry dissector; (9) needle-holder; (10) two small full-curved Hagedorn needles; (11) plain cumol catgut—No. 2, six envelopes (Figs. 280 and 281).

Operation.—First Step.—The speculum is introduced into the vagina and the parts exposed to view. The tumor is then seized with bullet forceps and an incision made around it through the vaginal wall and well outside of the infiltrated area (Fig. 291).

Second Step.—The tumor is pulled forward by the bullet forceps and separated from the underlying structures with a dry dissector or scalpel (Fig. 292).

Third Step.—The edges of the wound are approximated and united by deep interrupted catgut sutures.

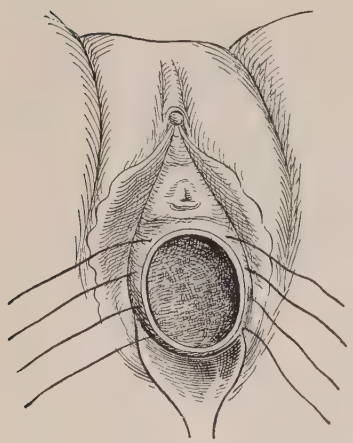


Fig. 293.—Operation for Cancer of the Vagina.—Third Step.

Fourth Step.—The vagina is irrigated with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and dried with a gauze sponge. It is then packed with gauze and the vulva protected with a compress secured by a T-bandage.

Variations in the Technic.—The walls of the vagina are naturally very relaxed and elastic, consequently a large wound may be made and primary union obtained. This fact is important to remember, as it is always necessary, in extirpating the tumor, to make the incision well beyond the infiltrated area.

When the tumor is situated in the anterior or posterior vaginal wall and the underlying portion of the bladder or rectum is involved and adherent, it should be removed along with the growth by making a deeper incision and cutting away the entire mass with right and left curved scissors. The wound is then closed with sutures. (See the technic of operations on vesicovaginal and rectovaginal fistulas, pp. 758 and 771.)

Tumors occupying the posterior vault of the vagina, which are adherent to the peritoneum, are removed by opening the culdesac of Douglas and excising all the diseased structures. The peritoneum is then closed with catgut sutures and the edges of the vaginal wound united in the usual way.

It is important to obtain primary union whenever possible, and in cases requiring resection of a portion of the vaginal vault the raw surface may often be covered over by drawing up the lower edge of the wound and suturing it to the cervix, which has previously been denuded.

When the inguinal glands are involved, they must be removed.

After-treatment.—Care of the Wound.—The gauze packing is removed in forty-eight hours and not reintroduced. The vagina is then irrigated daily with a solution of corrosive sublimate (1 to 2000) and the antiseptic washed out with hot normal salt solution. The corrosive sublimate injections are continued while the patient remains in bed, and a daily douche of hot normal salt solution is then given once a day for several weeks.

THE BLADDER.—The urine should be passed spontaneously or drawn with a catheter every eight hours.

THE BOWELS.—The bowels should be moved on the second day and then opened once every twenty-four hours.

THE DIET.—During the first forty-eight hours a liquid diet (see p. 106) should be given; then a soft diet (see p. 111) until the end of the week; and, finally, the patient is placed upon a convalescent diet (see p. 114).

RESTLESSNESS AND PAIN.—Pain is controlled by the use of rectal suppositories or hypodermic injections of morphin, and sulphonal or trional is administered if the patient becomes restless.

GETTING OUT OF BED.—The patient should remain in bed for ten days unless the rectum, bladder, or peritoneum have been wounded, in which case the time should be extended to at least two weeks.

Total Extirpation of the Vagina.—This operation, in my judgment, should never be performed, because if the disease is extensive enough to require total extirpation of the vagina the case is absolutely hopeless, and hence operative measures involving immediate danger to life without offering the slightest chance of relief cannot honestly be advised.

The Use of the *x*-rays.—The *x*-ray treatment of cancer of the vagina is fully described on page 76.

Palliative Treatment.—This form of treatment is indicated when it is found to be impossible to eradicate the disease by operative measures.

The treatment is purely palliative in character and directed toward the relief of the following symptoms: (*a*) Discharge and hemorrhages; (*b*) pain; (*c*) dribbling of urine and escape of feces; and (*d*) exhaustion.

Discharge; Hemorrhages.—These symptoms, which accompany the later stages of the disease, are exceedingly annoying and distressing to the patient, and hasten the end from exhaustion. The foul and offensive nature of the vaginal secretions makes the patient repulsive to herself and to those with whom she comes in contact.

These symptoms are controlled by the following operation:

Curetment and Cauterization.—This operation is followed by good results and should be the first step in the palliative treatment of vaginal cancer. It lessens the quantity and corrects the odor of the discharge and stops for a time the continuous bleeding which is exhausting the patient. The development of the disease is, therefore, less rapid and the patient rendered more comfortable.

TECHNIC OF THE OPERATION.—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 830 and 831.

Owing to the ulcerated and friable condition of the tissues, the usual method of cleansing the vagina at the time of operation cannot be followed in these cases, as serious injury might result or a false passage be made into one of the neighboring organs. It would be impossible, under the circumstances, to sterilize the parts even if an attempt was made to do so, and the cleansing should therefore consist in irrigating the vagina with a solution of corrosive sublimate (1 to 2000), followed by the same quantity of hot normal salt solution. The external organs, perineum, anal region, and the inner surface of the thighs are then thoroughly scrubbed with a gauze sponge saturated with warm water and liquid soap, and the parts finally douched with plain sterile water.

Position of the Patient.—Dorsal position.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse are required.

Instruments.—(1) Simon's speculums (curved and flat blades); (2) right and left Emmet's slightly curved scissors; (3) six short hemostatic forceps; (4) dressing

forceps; (5) tissue forceps; (6) sharp spoon curet; (7) Paquelin cautery; (8) needle-holder; (9) two small full-curved Hagedorn needles; (10) plain cumol catgut—No. 2, four envelopes.

Operation.—The speculum is introduced into the vagina and the parts exposed to view. The canal is then dried with a gauze sponge and the situation

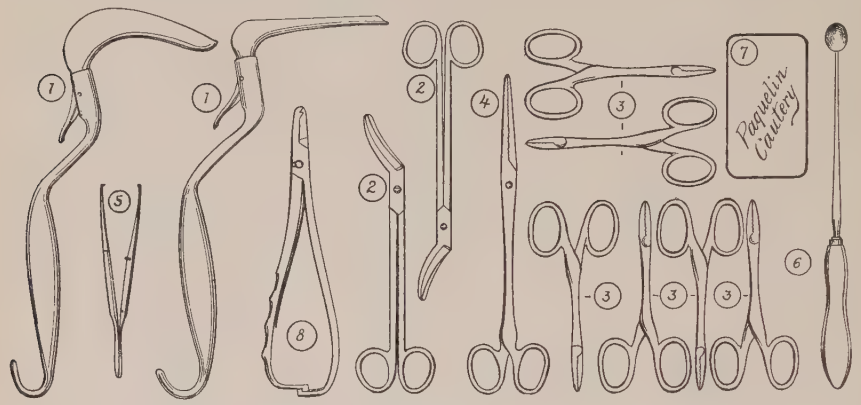


FIG. 294.—INSTRUMENTS USED IN THE OPERATION OF CURETMENT AND CAUTERIZATION FOR CANCER OF THE VAGINA.

and extent of the ulcerated tissues carefully examined. The diseased and friable structures are now cautiously scraped away with the curet until apparently healthy tissue is reached, and the uneven and ragged edges of the wound are removed with curved scissors. The blood and fragments of loose tissue are wiped away with a sponge and the cureted surfaces cauterized with Paquelin's cautery. The vagina is then irrigated with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and dried with gauze sponges. It is then packed with gauze and the vulva protected with a gauze compress held in position by a T-bandage.

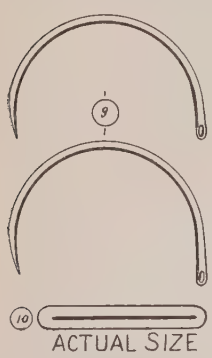


FIG. 295.—NEEDLES AND SUTURE MATERIAL USED IN THE OPERATION OF CURETMENT AND CAUTERIZATION FOR CANCER OF THE VAGINA.

SPECIAL DIRECTIONS.—There is always more or less danger in curetment of making a false passage into one of the neighboring organs. This can only be avoided by a very careful manipulation of the curet, which is guided by the eye of the operator and the sensations conveyed to his fingers through the handle of the instrument.

In the beginning of the operation the hemorrhage is usually severe, but it lessens as the diseased tissues are removed and ceases entirely when all the friable structures have been scraped away. If, however, a spurting vessel is seen, it should be caught at once and ligated by passing a curved needle threaded with catgut through the tissues immediately beneath it.

VARIATIONS IN THE TECHNIC.—Pure sulphuric or nitric acid may be substituted for the cautery. Under these circumstances the surrounding mucous membrane must first be protected by smearing it with vaselin, and the chemic agent subsequently neutralized by applying small pledgets of absorbent cotton

soaked in a saturated solution of sodium bicarbonate directly to the diseased areas.

After-treatment.—*Care of the Wound.*—The gauze packing is taken out in twenty-four hours and not reintroduced. The vagina is then irrigated daily with a solution of corrosive sublimate (1 to 2000), followed by a quart of hot normal salt solution.

The Bladder.—The urine should be passed spontaneously or drawn with a catheter every eight hours.

The Bowels.—The bowels should be moved on the day after operation and then opened once every twenty-four hours.

The Diet.—A liquid diet (see p. 106) should be given during the first forty-eight hours and the patient then placed upon a convalescent diet (see p. 114).

Restlessness and Pain.—The free use of opium is indicated and the drug should be given in the form of rectal suppositories or administered hypodermically.

Getting Out of Bed.—The patient should remain in bed one week.

The Subsequent Treatment.—After the patient gets out of bed every effort must be made to control the character and quantity of the discharges and protect the vulva from their irritating influence. The first of these indications is met by the use of medicated vaginal douches, which should be used night and morning. Creolin, f℥ij to the quart; lysol, 1 per cent.; and permanganate of potassium, 1 to 3000, are very useful preparations, and are not irritating to the vagina. Some patients do well on carbolic acid, 3 to 5 per cent., or corrosive sublimate (1 to 2000), and when these remedies are employed the medicated douche should be followed by an injection of a quart of hot normal salt solution to prevent local irritation or poisoning from absorption. The daily use of hydrogen peroxid is of great advantage when the discharge becomes offensive, and it should be applied every morning or evening just before the medicated douche is given. The patient should lie upon her back and inject two or three ounces of the remedy into the vagina with a small hard-rubber syringe.

The ulcerative process is often held in check and more or less modified by the use of methylene-blue or violet. The dry powder of either preparation may be dusted over the ulcerated surface through a speculum or a 1 per cent. solution may be applied as a lotion upon a cotton-wool tampon. Petroleum (refined oil) has also proved beneficial in these cases, and one ounce of the oil may be injected daily into the vagina and kept from escaping by inserting a cotton-wool tampon.

Sometimes the bleeding becomes excessive during the later stages of the disease and may require special treatment. It can usually be controlled by copious hot water vaginal injections and the introduction of a tampon of iodoform gauze. This treatment should be given regularly and continued as long as the bleeding lasts. Good results are also obtained with a large cotton-wool tampon soaked in a saturated solution of alum and introduced into the vagina.

The comfort of the patient is greatly increased by protecting the external organs from contact with the irritating vaginal discharges. This is accomplished by washing the vulva night and morning with warm water and soap, applying carbolized vaselin (3 per cent.), and wearing a vulvar pad to absorb the secretions.

Pain.—This symptom must be controlled with opium and the dose gradually increased as the disease progresses.

Dribbling of Urine; Escape of Feces.—The management of these complications is fully discussed under the treatment of vesicovaginal and rectovaginal fistulas on pages 763 and 772.

Exhaustion.—While nothing can be done to benefit the patient per-

manently, yet much may be accomplished both mentally and physically by an intelligent management of the constitutional effects of the disease and the administration of tonic remedies. The surroundings of the patient should be made as cheerful as possible and her mind must be kept from brooding over her troubles. She should not be told the nature of her disease unless there are reasons for doing so, and the word "*cancer*" should never be used in her presence.

The diet should be easily digested, appetizing, and nutritious. Alcoholic stimulation is important and may be given in the form of a red wine or champagne at lunch and dinner, or a milk-punch containing about an ounce of whisky or brandy may be taken three times daily. The amount of alcohol of course depends upon the indications in each case, and judgment must be used to prevent overstimulation. The patient should have plenty of fresh air and sunshine and she should walk or drive every day if her strength and opportunities permit. Very few drugs are indicated internally. The use of opium to relieve pain has been referred to. Sulphonal and trional are at times useful to promote sleep, and strychnin is often indicated for its stimulating action. I have derived good results from the following formula, which I am in the habit of giving for an indefinite period after the operation of curetment and cauterization:

℞. Hydrargyri chloridi corrosivi,
Acidi arsenosi, ... āā gr. j
Extracti nucis vomicæ, ... gr. xxv
Ferri et quininæ citratis, ... gr. cc.
M. et ft. pil. c.
Sig.—One pill three times daily after meals.

SARCOMA.

Causes.—Sarcoma of the vagina may occur as a *primary* or *secondary* disease. The former is a very rare affection, and is met even less seldom than primary cancer of the vagina. While the most frequent starting-point of a secondary involvement is the cervix, it may also begin elsewhere, and eventually attack the vagina by metastasis.

Nothing is known of the cause of the disease. While the majority of cases occur in early life, yet all ages are liable, as the affection has been observed in a new-born infant, in young children, and in very old women. When sarcoma of the vagina occurs in childhood, it generally manifests itself about the second or third year of life.

Symptoms.—The disease occurs clinically as a round circumscribed tumor and as a diffuse superficial infiltration. The *first variety* is the one most frequently met in adults and is the usual form in children. It appears in the beginning as a globular tumor with a broad base, which later becomes more or less pedunculated and resembles a fibroid polypus. It is bright or dark red in color and undergoes ulcerative change very slowly, as shown in a case occurring in a new-born infant which did not result fatally until the seventh year.

The *second variety* begins as a small nodule or growth in the vaginal wall which gradually increases in size, and at the same time the mucous membrane and surrounding tissues become infiltrated. Ulceration finally occurs and the affection rapidly goes from bad to worse.

The disease spreads into the surrounding structures by means of the blood and the walls of the blood-vessels. The lymphatic glands, as a rule, are not involved except in the melanotic form. The bladder and rectum eventually become affected, and in time the ureters and kidneys are involved.

The usual situation of sarcoma is in the lower part of the vagina. In the

adult it attacks the anterior and posterior walls with equal frequency, but in children the anterior wall is the usual seat of the affection.

The chief symptoms are *hemorrhage* and *discharge*. The bleeding, which is caused by ulceration, is slight at first, but later it becomes more and more marked, until there is a continuous loss of blood, which is accompanied at times with severe hemorrhages. The discharge in the beginning is watery in character and of a foul odor, but as the ulcerative process spreads and the tissues become gangrenous it is mixed with blood, fragments of broken-down tissue, pus, and sloughing masses, and it also contains urine or feces if the bladder or rectal wall is destroyed.

Pain does not, as a rule, occur until ulceration begins, and is referred to the pelvis, the rectum, or the bladder and along the sciatic nerves. *Pruritus vulvæ* is a frequent symptom, and is due to the irritation produced by the vaginal discharges. And, finally, the sarcomatous infiltration interferes with the functions of the rectum or the bladder and prevents sexual intercourse or acts as an obstacle to labor.

Where the disease occurs as a circumscribed tumor, there is a sensation of pressure and bearing-down in the pelvis. This symptom is manifested very early in children on account of the small dimensions of the vagina and bony pelvis.

The *constitutional symptoms* and the *effect upon the general health* are the same as when sarcoma attacks other parts of the body.

Diagnosis.—The diagnosis is based upon the symptoms, the physical characteristics of the growth, and the microscopic examination.

Differential Diagnosis.—Sarcoma of the vagina must be distinguished from fibroma and carcinoma.

Prognosis.—The course of the disease is rapid when it occurs as a diffuse superficial infiltration, and slow in the circumscribed form. The prognosis is bad even after complete extirpation. The only hope for the patient is an early recognition of the disease and its thorough removal.

Treatment.—The treatment is the same as already described in cancer of the vagina on page 289.

VAGINAL FLATUS.

Definition.—The accumulation and audible expulsion of air or gas from the vagina. This affection is also known as *garrulity* or *incontinence of the vulva*.

Causes.—The disease is not uncommon. It is most frequently caused by relaxation and gaping of the vulvovaginal orifice due to traumatism and loss of adipose tissue from general emaciation. Under these conditions any change of position which results in the intestines falling temporarily away from the pelvis will cause the air to be sucked into the vagina and subsequently expelled with more or less noise when the intra-abdominal pressure upon the pelvic organs returns. Thus, air may be drawn into the vagina when the patient assumes the recumbent posture, but more especially when she quickly rolls over upon one side or the other. I have met several cases where the symptom occurred only during sexual intercourse. The vaginal entrance was more or less relaxed in all these women and the affection was undoubtedly due to the piston-like action of the penis drawing in and expelling the air. Gas may escape from the rectum into the vagina through a fistulous opening or it may also be produced by sloughing uterine or vaginal tumors and be expelled when the abdominal pressure is exerted. And, finally, the symptom may be artificially caused by placing a woman in the knee-chest posture and then suddenly changing to the recumbent position

Prognosis.—The affection can always be cured by removing the cause.

Treatment.—The indication is to discover and remove the cause. In some cases the affection is cured by repairing a torn perineum or narrowing a relaxed vulvovaginal orifice, and in others it may be necessary to remove a sloughing tumor or close a fistulous opening into the rectum.

CHAPTER XVI.

THE UTERUS.

METHODS OF EXAMINATION.

The uterus can be examined by the following methods:

Indirect inspection.
Vaginal touch.
Vagino-abdominal touch.
Recto-abdominal touch.
Rectovesical touch.
Artificial uterine prolapse.
Sounding.
Microscopic and bacteriologic examinations.

INDIRECT INSPECTION.

Limitations.—The intravaginal cervix is the only portion of the uterus that can be seen by inspection through a speculum. In cases of prolapse, however, it is often exposed to view at or outside of the vulvovaginal outlet.

Information.—By inspection we can ascertain the size, shape, and general appearance of the cervix and the os uteri, as well as the presence or absence of inflammation, erosion, laceration, cystic degeneration, cervical diseases, ulceration, neoplasms, and other pathologic conditions.

Instruments.—The following instruments are required: (1) Goodell's bivalve speculum; (2) Sims's duck-bill speculum; (3) Simon's speculums (curved and flat blades); (4) vaginal depressor; (5) dressing forceps; (6) two tenaculums.

Description of the Instruments.—The instruments, with the exception of the tenaculums, are described under Indirect Inspection of the Vagina on page 227.

Preparation of the Patient.—The rectum should be emptied with an enema of soapsuds and warm water and the urine voided naturally just before the examination. The corsets should be removed and all clothing that constricts the waist should be loosened.

Position of the Patient.—Three positions are employed for inspecting the cervix: The dorsal, the left lateral-prone, and the knee-chest postures.

Dorsal Position.—For routine examinations this position is very satisfactory and is more frequently used than the others. The disadvantage of this posture, however, is that the cervix is exposed by forcibly separating the vaginal walls with the blades of the speculum, and consequently its lips are apt to be more everted or turned out in cases of laceration than they are in reality. And, again, as the vagina does not balloon out in this position the cervix is difficult to expose in women who are fat or who have relaxed vaginal walls.

Left Lateral-prone Position.—This position is especially valuable in examining the cervix in cases of laceration, as the vagina balloons out when Simon's speculum is introduced, and hence the relations existing between the cervical

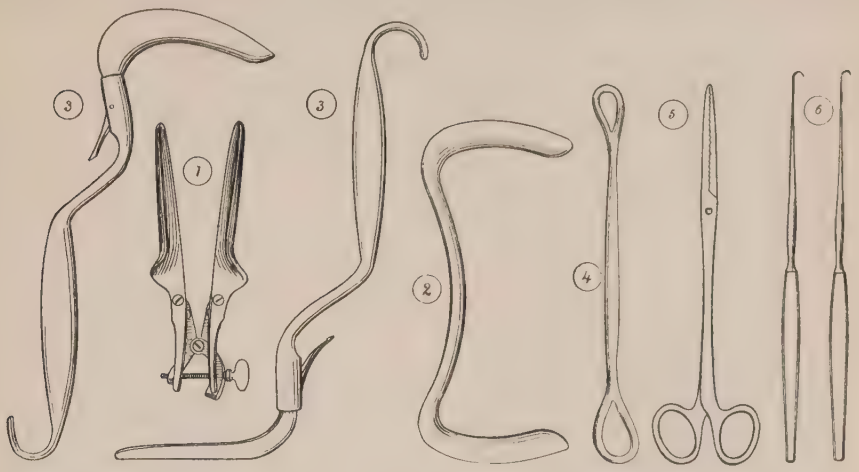


Fig. 296.—Instruments for Indirect Inspection of the Uterus.

lips are not disturbed by traction on the vaginal walls. For the same reason the inspection of other pathologic conditions of the cervix is more satisfactory when the patient is placed in this position, as the vaginal vault is expanded and the entire cervical prominence is exposed to view.

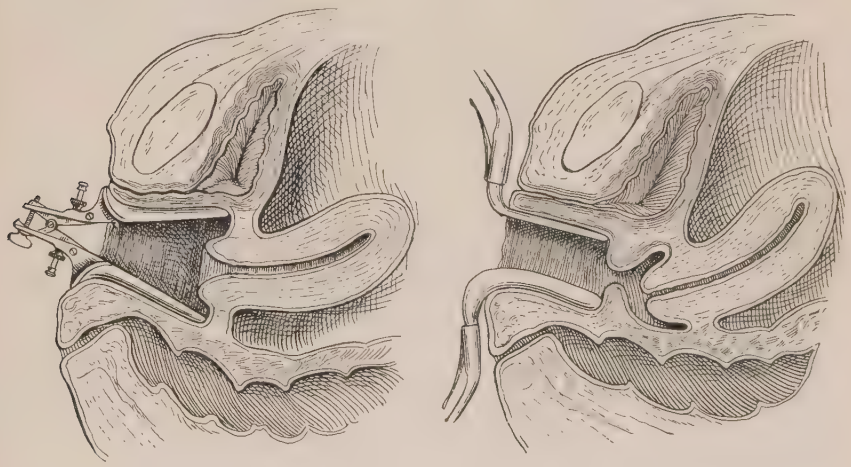


Fig. 297. Fig. 298.

Indirect Inspection of the Uterus.

Fig. 297 shows forcible separation of the lips of a lacerated cervix when the examination is made in the dorsal position; Fig. 298 shows failure of the vagina to balloon out when the examination is made in the dorsal position.

Knee-chest Position.—The indications are the same as for the left lateral-prone posture. In the knee-chest position, however, the vagina is more fully expanded, and consequently a better view is obtained of the cervix (Fig. 299).

Antisepsis.—See Indirect Inspection of the Vagina (p. 230) and the chapter on The General Technic of Gynecologic Examinations (p. 22).

Technic.—Having placed the patient in the proper position, the speculum is warmed by dipping it into hot water and the blades are lubricated with liquid soap. The examiner is now ready to introduce the speculum.

Goodell's Bivalve Speculum.—This instrument is used with the patient in the dorsal position; the method of its introduction is described under Indirect Inspection of the Vagina on page 230.

Sims's Speculum.—This instrument is used with the patient in the knee-chest or left lateral-prone posture; the method of its introduction is described under Indirect Inspection of the Vagina on page 232.

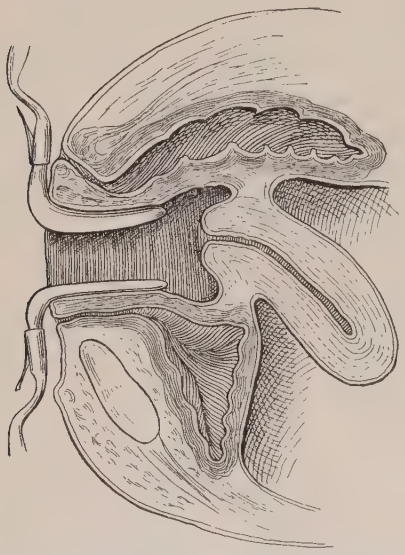


FIG. 299.—INDIRECT INSPECTION OF THE UTERUS. Shows the vagina ballooned out when the examination is made in the knee-chest position (page 297).

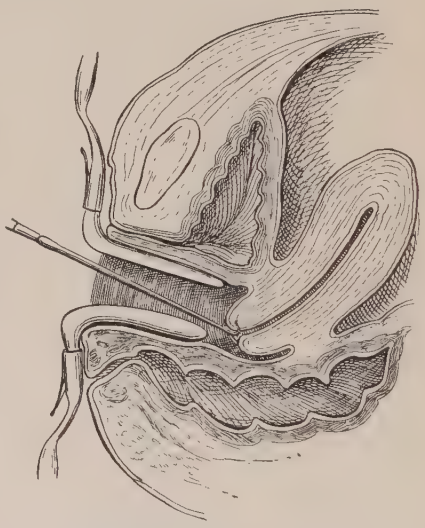


FIG. 300.—INDIRECT INSPECTION OF THE UTERUS. Shows the cervix being drawn into the lumen of the speculum with a tenaculum.

Simon's Speculums.—These instruments are used in the dorsal, left lateral-prone, or the knee-chest position; the methods of their introduction are described under Indirect Inspection of the Vagina on page 234.

Special Directions.—If the cervix only partially engages in the lumen of the speculum after the instrument is introduced into the vagina, it should be hooked with a tenaculum and drawn into the proper position. Sometimes the secretions are so profuse and thick that the underlying surface of the cervix cannot be seen, and under these circumstances they should be removed with a pledget of absorbent cotton held in the grasp of dressing forceps.

VAGINAL TOUCH.

Limitations.—By vaginal touch we can palpate the intravaginal and supravaginal cervix, the anterior surface of the body of the uterus when the organ is in its normal position or the posterior surface when it is retrodisplaced, and also the lateral uterine walls.

Information.—We can determine the size and shape of the os uteri and the position, form, and consistency of the cervix, as well as any evidences of laceration, erosion, cystic degeneration, discharges, ulceration, neoplasms, etc. The location of the fundus and the position and mobility of the uterus can also be ascertained.

Vaginal touch is chiefly useful in diagnosing lesions of the intravaginal cervix, and in the hands of the expert this method can also be employed with advantage in recognizing uterine displacements and fixations. But it should never be relied upon alone to diagnose these conditions, because in the absence of counter-pressure which is used in bimanual touch the uterus slips away from the finger and consequently the organ cannot be thoroughly or satisfactorily palpated.

Preparation of the Patient.—Same as for Indirect Inspection.

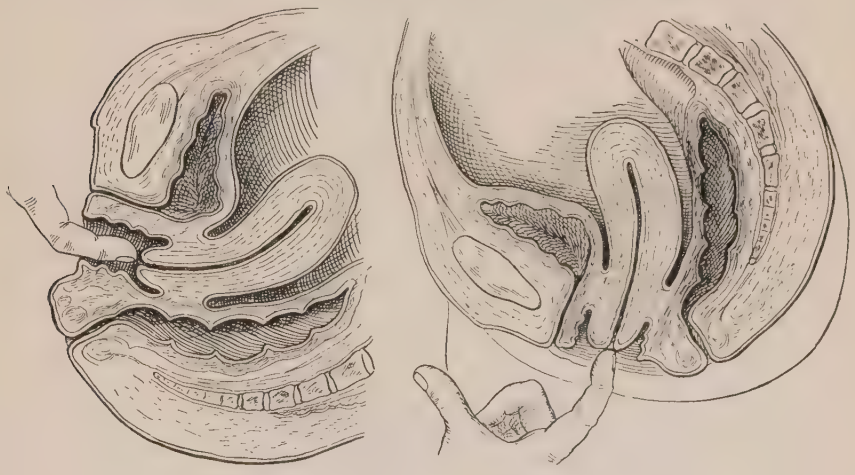


FIG. 301. FIG. 302.

EXAMINATION OF THE UTERUS BY VAGINAL TOUCH.

Fig. 301 shows the examination being made in the dorsal position; Fig. 302 shows the examination being made in the erect position. Note the difference in the degree of descent of the uterus in the two figures.

Position of the Patient.—Two positions are employed in palpating the uterus: The dorsal and the erect postures.

Dorsal Position.—This posture is used almost exclusively.

Erect Position.—This position is only employed to ascertain the degree of descent in cases of prolapse of the uterus and the vaginal walls.

Technic.—Having placed the patient in the dorsal position the examiner sits or stands in front of the vulva and introduces the index-finger of the left hand into the vagina with the palmar surface directed upward. The tip of the finger is then brought in contact with the cervix, which is gently palpated, and any pathologic conditions carefully noted (Fig. 303).

The finger is then passed in front, behind, and on each side of the cervix to feel for the body of the uterus, which will give the direction in which to look for the fundus. Having located and ascertained the position of the uterus and noted any abnormal alterations in shape, size, or consistency, its mobility is then estimated by pushing the organ in various directions and also by placing the tip of the finger directly under the cervix and making pressure upward (Fig. 304).

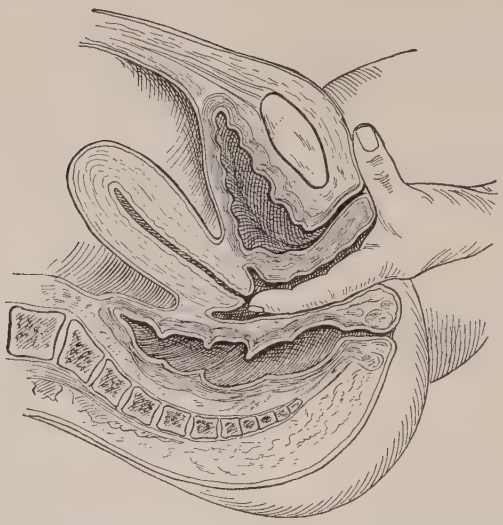


FIG. 303.—EXAMINATION OF THE UTERUS BY VAGINAL TOUCH (page 299).
Shows the tip of the finger palpating the cervix.

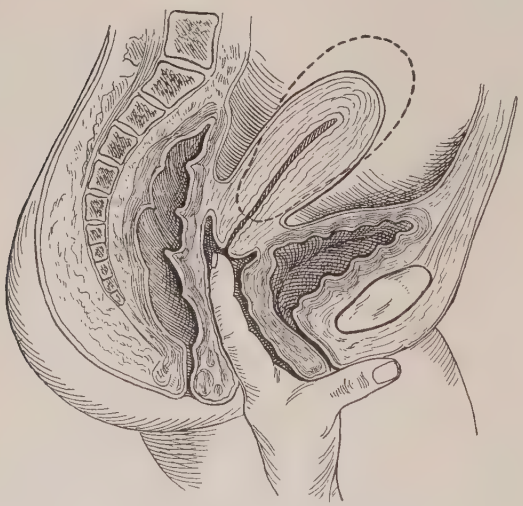


FIG. 304.—EXAMINATION OF THE UTERUS BY VAGINAL TOUCH (page 299).
Shows the mobility of the uterus being tested by elevating the cervix with the tip of the finger. The dotted outline represents the degree of mobility.

VAGINO-ABDOMINAL TOUCH.

Limitations.—By this method of investigation we can thoroughly palpate the entire uterus.

Information.—We can ascertain the size, shape, consistency, position, and the mobility of the uterus, as well as the presence of neoplasms, and we can also differentiate between uterine enlargements and pelvic tumors.

Preparation of the Patient.—Same as for Indirect Inspection.

Position of the Patient.—The examination should be made with the patient in the dorsal position.

Anesthesia.—An anesthetic is seldom required in thin women. It should, however, always be used whenever any doubt exists as to the condition of the pelvic organs, because a mistake in the diagnosis is very likely to occur unless there is perfect relaxation of the abdominal muscles. It is, therefore, necessary to employ an anesthetic in women who are muscular or fat or who are nervous, and also when pelvic inflammation is present and the parts are tender or sensitive.

Technic.—The object of a bimanual examination is to press the uterus down against the vaginal finger and to hold it in that position while the organ is palpated. If the pelvic organs are found to be more or less immovable, the internal and external pressure must be cautiously regulated, otherwise there is danger of breaking up adhesions or rupturing a pus sac.

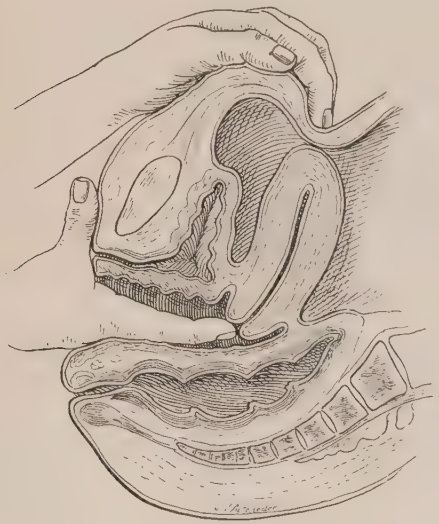


FIG. 305.

FIG. 306.

EXAMINATION OF THE UTERUS BY VAGINO-ABDOMINAL TOUCH.

Fig. 305 shows method of palpating the fundus and estimating the length and mobility of the uterus; Fig. 306 shows method of palpating the body of the uterus and the thickness and mobility of the organ.

After placing the patient in the proper position the examiner sits or stands in front of the vulva and passes the index-finger into the vagina up against the cervix. The fingers of the free hand are then placed over the pubes and pressure is made downward through the abdominal wall until the internal finger feels the counter-resistance against the cervix. The vaginal finger is now placed in front of the cervix while the external hand forces the fundus and body of the uterus down upon it. The internal finger then palpates the fundus and the anterior and lateral surfaces of the uterus and ascertains their shape and consistency as well as the width of the organ. By balancing the body of the uterus between the internal and external fingers we can estimate the thickness of the organ, and by moving it upward, backward, and to either side its mobility can be very accurately determined.

The length of the uterus can be determined by placing the internal finger

against the tip of the cervix while the external fingers press down the fundus, and then estimating the distance between the two points of resistance.

If the fundus is posterior, the internal finger is placed back of the cervix and the external fingers are pressed into the abdominal walls toward the promontory of the sacrum and the structures crowded downward against the anterior surface of the uterus. The internal finger then outlines the shape of the uterus and estimates its size, mobility, and consistency.

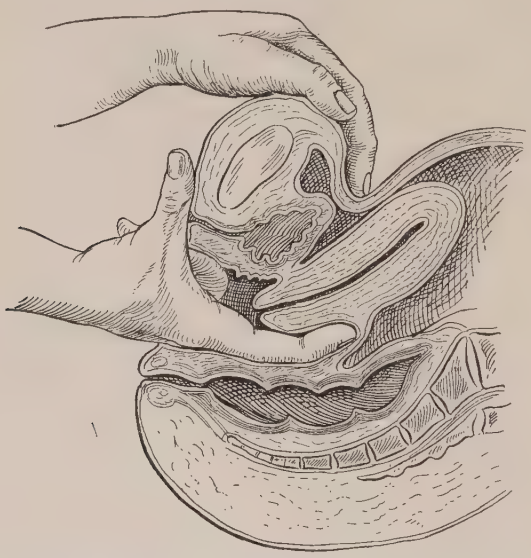


FIG. 307.—EXAMINATION OF THE UTERUS BY VAGINO-ABDOMINAL TOUCH.
Shows the method of estimating the thickness and mobility of a retrodisplaced uterus.

Whenever it is necessary to make very deep palpation with the internal finger an advance of from one to three inches can be gained by firm pressure with the knuckles of the examining hand against the perineum (Fig. 20). If the examination is made without an anesthetic and there is difficulty in outlining the uterus on account of muscular rigidity, the patient should take a full, deep inspiration, followed by a rapid expiration, which causes a short period of relaxation, which can be taken advantage of by the examiner.

RECTO-ABDOMINAL TOUCH.

Limitations.—By this method of investigation we can palpate the entire uterus. It is especially used to examine the posterior surface of the womb, which is more accessible through the rectum than through the vagina. Again, recto-abdominal touch is employed in children and unmarried women and in cases where the vagina is absent or the seat of a painful affection.

Information.—We can recognize the shape, size, consistency, position, and mobility of the uterus, as well as the presence of neoplasms. The relations existing between the uterus and a retro-uterine tumor can be more clearly outlined through the rectum than through the vagina, and in all cases which are in any way doubtful the rectal examin-

ation should always supplement the vaginal to confirm or disprove the diagnosis.

Preparation of the Patient.—Same as for Indirect Inspection.

Position of the Patient.—The examination should be made with the patient in the dorsal position.

Anesthesia.—In some cases an anesthetic is not required, especially in women who are thin; but, as a rule, a thorough investigation cannot be made unless the patient is anesthetized. It is therefore necessary to employ an anesthetic in women who are fat or nervous, and also when pelvic inflammation is present and the parts are too tender to palpate. Children and unmarried women should always be examined under an anesthetic.

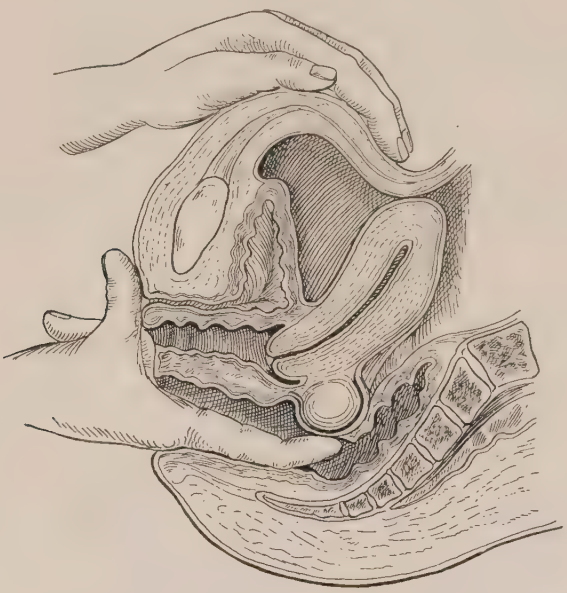


FIG. 308.—EXAMINATION OF THE UTERUS BY RECTO-ABDOMINAL TOUCH.
Shows the method of recognizing a retrouterine tumor.

Technic.—After placing the patient in the dorsal position the examiner sits or stands in front of the vulva and passes the index-finger of the left hand into the rectum with the palmar surface directed upward. The fingers of the free hand now make pressure downward through the abdominal wall in the direction of the promontory of the sacrum, if a retrodisplacement is present, until the internal finger feels the counter-resistance communicated to the uterus. The rectal finger is then passed over the posterior surface and the sides of the uterus, noting the shape, size, consistency, position, and the mobility of the organ, as well as any adjacent pathologic lesions (Fig. 309).

If the uterus is situated anteriorly, the fingers of the free hand press the fundus backward so as to bring the posterior surface of the uterus within reach of the rectal finger (Fig. 310).

If during the examination the intestines are found crowding the pelvic organs, the finger is withdrawn from the rectum and the patient placed temporarily in

the knee-chest position and air admitted into the vagina. The patient is then slowly placed again in the dorsal position and the intestines kept out of the pelvis

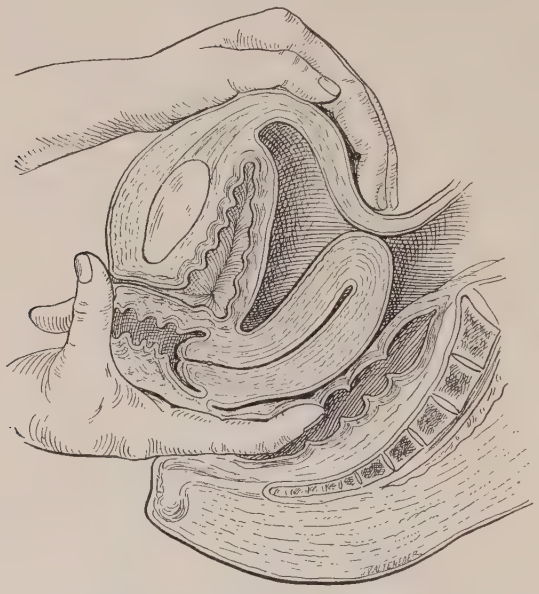


FIG. 309.—EXAMINATION OF THE UTERUS BY RECTO-ABDOMINAL TOUCH.
Shows the method of estimating the shape, size, and mobility of a retrodisplaced uterus

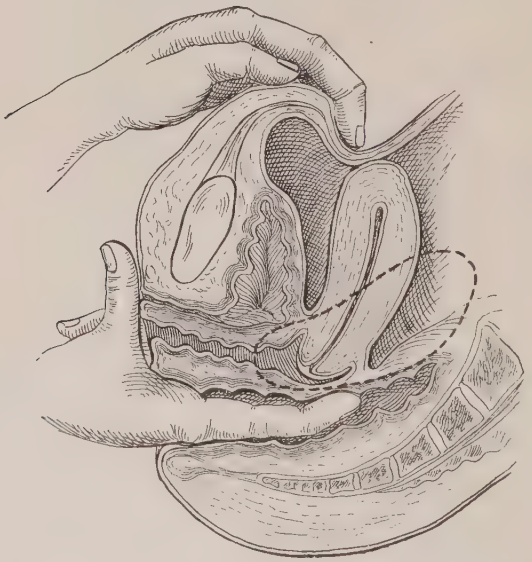


FIG. 310.—EXAMINATION OF THE UTERUS BY RECTO-ABDOMINAL TOUCH.
Shows a normally situated uterus being pushed backward against the finger in the rectum. The dotted outline shows the artificial displacement.

by keeping the hips constantly higher than the abdomen while she is being turned upon her back. The internal finger can be passed higher up in the rectum by

making firm pressure with the knuckles of the examining hand against the anus and the perineum (Fig. 88). A temporary relaxation of the abdominal muscles and a deeper touch can be obtained when the patient is not under an anesthetic by having her take a long inspiration followed by a short expiration, and palpating the parts rapidly while the air is being expelled from the lungs.

RECTOVESICAL TOUCH.

Limitations.—This method of examination is very seldom employed, and it is only used to determine the presence or absence of the uterus in cases in which the vaginal canal is congenitally deficient or entirely obliterated.

FIG. 311.—STEEL BLADDER SOUND. INSTRUMENT USED FOR EXAMINATION OF THE UTERUS BY RECTOVESICAL TOUCH (page 306).

Preparation of the Patient.—The rectum should be emptied with an enema of soapsuds and warm water and the urine voided naturally just before the examination. The corsets should be removed and all clothing that restricts the waist must be loosened.

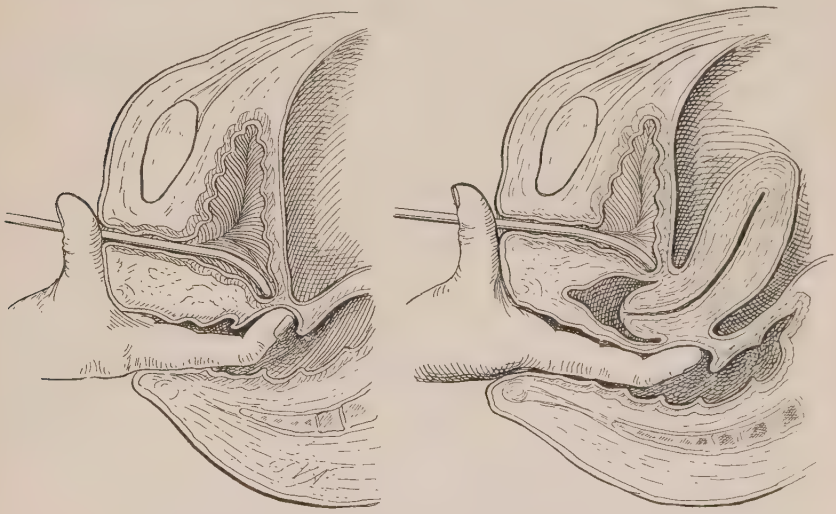


FIG. 312. FIG. 313.

EXAMINATION OF THE UTERUS BY RECTOVESICAL TOUCH.

Fig. 312 shows the uterus absent; Fig. 313 shows the uterus present.

The external urinary meatus and the vulva should be thoroughly sterilized by scrubbing the parts with a gauze sponge saturated with tincture of green soap and warm water, and then washing them with a solution of corrosive sublimate(1 to 2000), which in turn is removed by douching with normal salt solution.

Position of the Patient.—Dorsal posture.

Instruments.—The only instrument that is required is a small steel bladder sound having a slightly curved tip (Fig. 311).

Antisepsis.—The sound is boiled in a soda solution for five minutes and then placed in a tray until ready for use. The instrument should be lubricated with sterile liquid white vaselin to facilitate its introduction into the bladder and the examiner should wear rubber gloves to guard against infection.

Anesthesia.—An anesthetic is always required.

Technic.—The examiner sits in front of the vulva and exposes the urinary meatus. The sound is then introduced into the urethra and passed directly into the bladder. The index-finger is now introduced into the rectum with the palmar surface directed upward and the tip slightly bent in an anterior direction. The end of the sound is then turned toward the base of the bladder by rotating the handle and an effort made to feel it with the rectal finger. If the tip of the sound is felt by the internal finger when it is moved up and down and laterally in the pelvic cavity, there can be no solid body occupying the pelvis, and hence the uterus must be absent.

ARTIFICIAL UTERINE PROLAPSE.

Limitations.—A more thorough and complete examination can be obtained by this method than with bimanual palpation alone. The entire surface of the organ can be distinctly felt and thoroughly palpated.

Information.—This method may be used in connection with vagino-abdominal and recto-abdominal touch. The lesions which are usually ascertained by these examinations are more clearly defined and more easily recognized when the uterus is drawn down toward the vaginal outlet than when the organ is examined in the usual way. Artificial uterine prolapse should therefore be practised when the results of an examination are unsatisfactory and the nature of the lesions uncertain.

Preparation of the Patient.—Same as for Indirect Inspection.

Position of the Patient.—Dorsal posture.

Instruments.—The only instrument required is a pair of bullet forceps.

Fig. 314.—Bullet Forceps.
Instrument used in making an artificial uterine prolapse.

Anesthesia.—An anesthetic should usually be employed.

Contraindications.—This method should never be practised when adhesions or an inflammatory tubo-ovarian disease is present. The uterus should be mobile, and if it cannot be drawn down without using undue force the method must not be attempted.

Technic.—The examiner sits in front of the vulva and introduces the index-finger into the vagina up to the cervix. The bullet forceps is then passed along the finger to the cervix, which is seized by the anterior lip and slowly pulled

down close to the vulvovaginal orifice. An assistant now takes the forceps and holds the cervix in this position while the examiner introduces the index-finger of the left hand into the rectum and places the fingers of the free hand on the abdomen just above the pubes. The fundus and posterior surface of the uterus are then thoroughly palpated with the rectal finger and a careful note made of all pathologic conditions found. In order to palpate the anterior surface of the uterus through the rectum the examiner hooks the tip of the finger over the

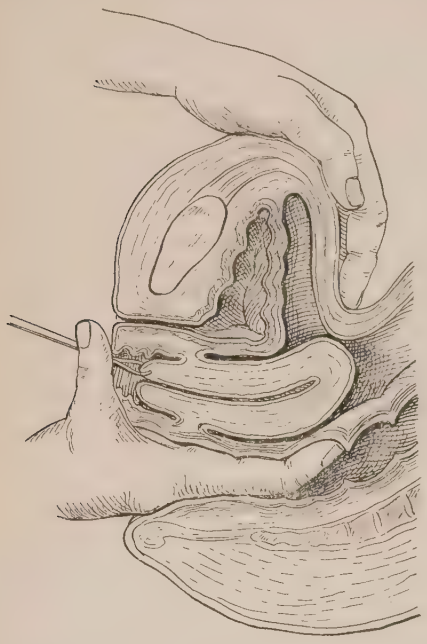


FIG. 315.

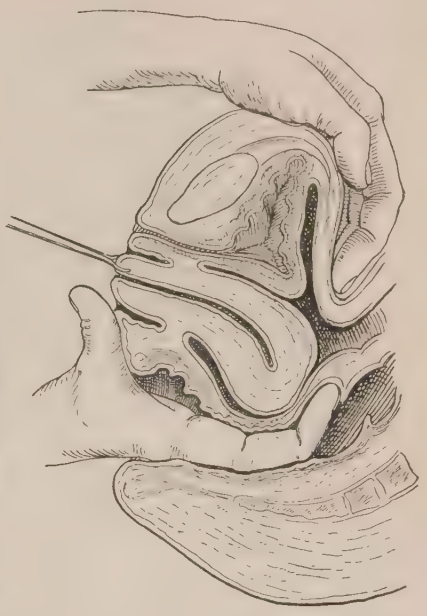


FIG. 316.

ARTIFICIAL UTERINE PROLAPSE.

Fig. 315 shows the fundus and posterior wall of the uterus being palpated; Fig. 316 shows the rectal finger hooked over the fundus and the anterior wall of the uterus being palpated.

fundus and gradually pulls it downward toward the perineum, thus producing an exaggerated degree of retroflexion.

After-treatment.—When the examination is completed, the forceps is detached from the cervix and the uterus restored at once to its normal position in the pelvis. This is accomplished by pushing the cervix up with the index-finger and drawing the fundus forward by the abdominal hand.

The patient should remain in bed for at least twenty-four hours to guard against any possible bad effect from the manipulations.

SOUNDING.

Information.—The uterine sound is seldom used at the present day. Formerly, however, it was constantly employed for diagnostic purposes, and many cases of septic endometritis with subsequent tubal infection followed its use. The common practice among some physicians of sounding the uterine cavity as a routine method of diagnosis is dangerous both to the health and the life of their patients, as septic infection followed by pelvic complications is likely

to result. The larger my experience grows, the more I am convinced that a safe rule to follow is, never enter the uterine cavity nor the cervical canal unless it is done under an anesthetic and with strict operative antisepsis.

So far as the diagnosis of uterine lesions is concerned, nothing can be accomplished by the use of the sound which cannot be more satisfactorily and more safely ascertained by other methods of examination, and hence the instrument

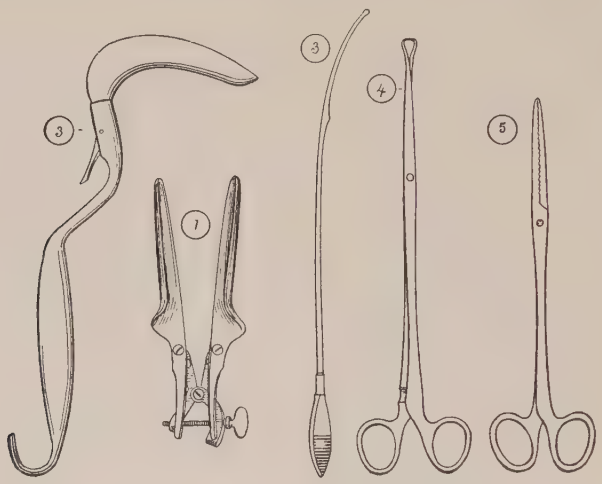


Fig. 317.—Instruments Used for Sounding the Uterus.

should never be employed except in making a differential diagnosis between an inversion of the uterus or a polypus or to probe a uterine fistula and to locate a congenital or traumatic atresia of the canal.

Preparation of the Patient.—The urine should be voided naturally just before the examination and the rectum should be emptied with an enema of soapsuds and warm water. The corsets should be removed and all clothing restricting the waist must be loosened.

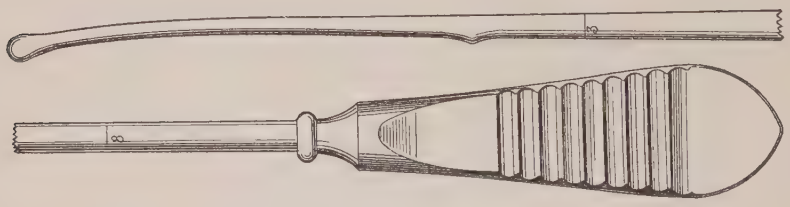


Fig. 318.—Uterine Sound. Actual Size.

After the patient is fully under the anesthetic the vagina and internal organs are thoroughly sterilized (see p. 831).

Position of the Patient.—Dorsal position.

Anesthesia.—An anesthetic must always be employed.

Instruments.—The following instruments are required: (1) Goodell's speculum; (2) Simon's speculum (curved blade); (3) uterine sound; (4) bullet forceps; (5) dressing forceps.

The uterine sound is a long surgical probe made of copper and plated with nickel. To mark the normal length of the uterine cavity a knob is made on the instrument 2½ inches from its tip, which serves as a guide to indicate how far the sound has entered the uterus.

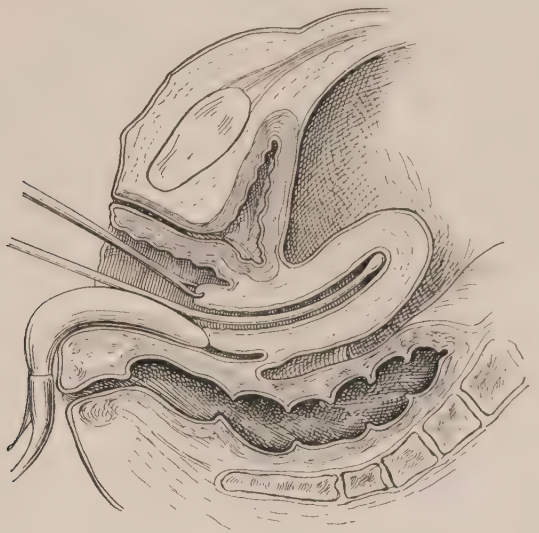


FIG. 319.—SOUNDING THE UTERINE CAVITY.

Antisepsis.—The instruments are sterilized by boiling them in a soda solution for five minutes.

Technic.—The examiner sits in front of the vulva, introduces the speculum into the vagina, and exposes the cervix to view. The anterior lip is then seized with bullet forceps and held in a fixed position while the cervical and uterine canal is explored with the sound.

MICROSCOPIC AND BACTERIOLOGIC EXAMINATION.

Limitations.—These methods of investigation are limited to an examination of discharges, excised fragments, and curet findings from the cervical and uterine cavities.

Information.—We can determine the character of the infection in cases of endometritis; the absence or presence of malignant degenerations; and the nature of other pathologic conditions.

Technic.—The methods of collecting and preserving the specimens for a subsequent microscopic or bacteriologic examination are fully discussed in Chapter II.

MALFORMATIONS OF THE UTERUS.

Uterine anomalies are readily understood by recalling the fact that the uterus and the vagina result from the coalescence or fusion of the lower portions of the ducts of Müller and that the upper parts of these tubes, which do not unite, become the oviducts or the Fallopian tubes (Figs. 320, 321, 322, and 323).

The following uterine malformations have been observed:

Double uterus.	Rudimentary uterus.
Septate uterus.	Fetal uterus.
Two-horned uterus.	Infantile or pubescent uterus.
One-horned uterus.	Absence of the uterus.

Anomalies of the cervix.

Double Uterus (*Uterus Duplex* or *Didelphys*).—This anomaly results from a failure of union between those portions of the Müllerian ducts which

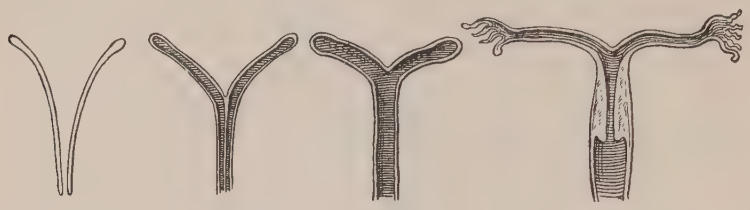


Fig. 320. Fig. 321. Fig. 322. Fig. 323.

Development of the Vagina, the Uterus, and the Fallopian Tubes from Müller's Ducts (page 310).

normally coalesce and form a single uterus. If the lowest portions of these ducts also fail to unite, a double vagina is formed and each cervix opens into a separate vaginal canal. While these two anomalies are usually associated, a number of cases have been observed in which a double uterus was present and the vagina found to be normally developed. A double uterus consists of two distinct organs lying side by side but not united, and each has but one oviduct, one ovary, one round and one broad ligament. Menstruation, as a rule, is normal; pregnancy

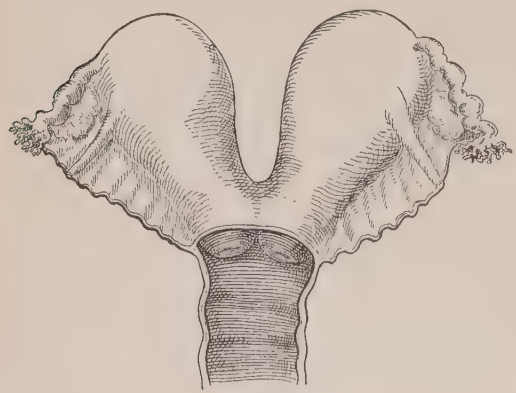


Fig. 324.—Double Uterus.

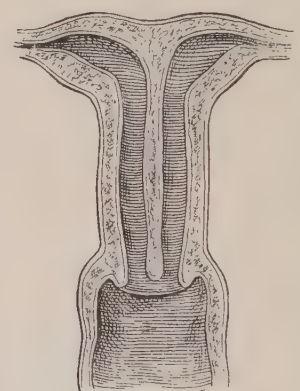


Fig. 325.—Septate Uterus.

may occur in both uteri at the same time; and childbirth generally occurs without accident. If, however, one uterus is imperforate but functionally active, it becomes distended with blood at the time of puberty and a *hematometra* is developed.

Septate Uterus (*Uterus Septus*).—This anomaly results from persistence, wholly or in part, of the coalesced walls of the united Müllerian ducts, the uterus being single, so far as its musculature is concerned, although its interior is divided into two cavities by a septum or partition. This septum may be

complete and extend from the fundus to the external os uteri, or it may be incomplete (*uterus subseptus*) and divide off only a part of the uterine cavity. Menstruation, as a rule, occurs normally, and pregnancy may take place in either half of the uterus or in both at once. Childbirth usually occurs without any complications unless the placenta is attached to the septum, in which case a serious post-partum hemorrhage may result. A septate uterus may be associated with either a double or single vagina.

Two-horned Uterus (*Uterus Bicornis*).—This anomaly may be defined as duplicity to a greater or less degree of the body of the uterus, while the lower part of the body and the cervix are single. The duplicity may be slight, being indicated by a notch on the fundus (*uterus cordiformis*), or it may extend almost to the os internum. In the latter case there may be found a septum partially or completely dividing the cervical canal. Again, the development of the two horns may not be symmetric, so that one may be larger than the other, and in some cases there will be found more or less division of the vagina.

This anomaly results from failure of union between the Müllerian ducts to an extent corresponding to the degree of duplicity in any individual case.

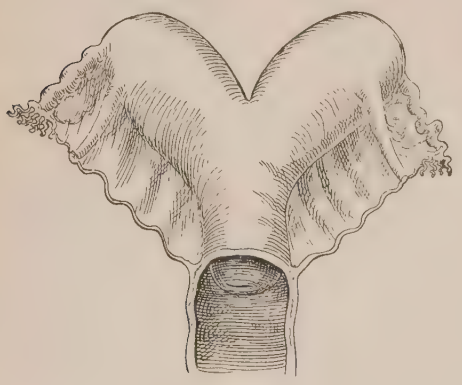


FIG. 326.—Full View.

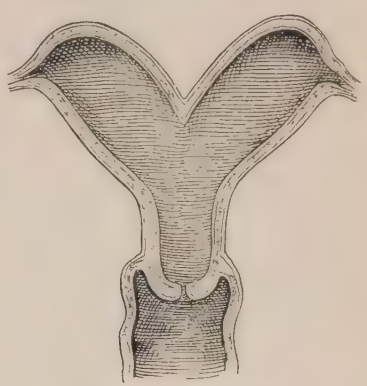


FIG. 327.—Sectional View.

TWO-HORNED UTERUS.

One-horned Uterus (*Uterus Unicornis*).—This malformation differs from the preceding in that the Müllerian ducts have not only failed to unite throughout the uterine area, but that one duct has failed to develop uterine characteristics, while the other has gone on to the production of fleshy walls, uterine glands, etc. Hence the Fallopian tube on the non-developed side opens into the base of the single uterus horn. More commonly, however, there will be a tube only on the side of the uterus horn into which the latter generally merges at its upper extremity, there being no fundus uteri. In cases of unicornate uterus both ovaries may be present, but the uterine ligaments, the ureter, and the kidney of the affected side may be absent or rudimentary. The anomaly is not at all incompatible with normal menstruation and pregnancy (Fig. 328).

Rudimentary Uterus.—The development of the uterus may have been arrested at such an early period of prenatal life as to have produced an organ without any of the essential uterine characteristics, and therefore functionally useless. There may be total lack of musculature (*uterus membranaceous*) and the rudimentary organ may present only a partial cavity or the cavity may be entirely absent. In the latter case there has been a partial arrest of development in the

first month of fetal life, during the stage when the Müllerian ducts are still solid cords of cells.

Such a serious defect in development as a rudimentary uterus, as might be expected, is usually accompanied by defective development of the vagina and the oviducts. The ovaries may also be defective, while the external genitals are less apt to show deviation from the normal condition.

Fetal Uterus.—The fetal type of uterus is due to the fact that development has not progressed beyond the stage normally present at birth, at which

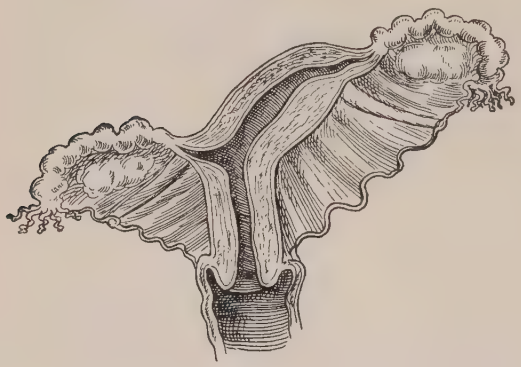


FIG. 328.—ONE-HORNED UTERUS (page 311).

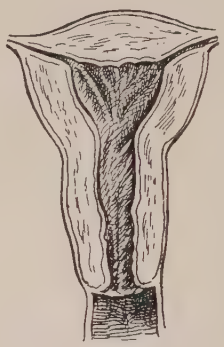


FIG. 329.—FETAL UTERUS.

time the cervix is larger than the body of the organ, the fundus is absent, the cavity is narrow from side to side, and there is no distinct internal os. Poor, or even absolutely defective development of ovaries, tubes, vagina, external genitalia, or mammæ is apt to be associated and produce corresponding functional derangement.

Infantile or Pubescent Uterus.—This form of defective development differs from the last in more nearly approximating the normal virgin uterus. The organ has the characteristics common to the uterus of childhood—a relatively larger uterine body being one of the chief points of distinction.

FIG. 330.—INFANTILE UTERUS.
From an infant one month old (modified from Sutton).

In these cases menstruation is apt to be absent, or it may be scanty and associated with dysmenorrhea and vicarious bleeding. Sterility is the rule, although in exceptional cases, as the result either of treatment or of a spontaneous growth of the uterus, conception has occurred and pregnancy continued to term. Usually, however, if impregnation does take place the product of conception dies and abortion occurs. The sexual appetite in these patients is usually more or less impaired, but, on the other hand, it may be perfectly normal.

Absence of the Uterus.—Complete absence of the uterus is a very rare occurrence, and, as a rule, in those cases in which such a diagnosis was made during life an autopsy has revealed some slight vestige of the organ. The anomaly is usually associated with defective development in other genital organs as well as a generally ill-developed physique, although it may be found in women who are well proportioned and otherwise perfectly formed.

Anomalies of the Cervix.—Malformation of the cervix may exist alone or in connection with other genital defects, especially of the body and fundus of the uterus.

The following cervical malformations have been noted: Atresia, stenosis, elongation or hypertrophy, a conical shape of the cervix associated with a pinhole os, absence or defective development, and a double os uteri.

DISEASES OF THE UTERUS.

INJURIES OF THE BODY.

Causes.—Owing to the position of the non-gravid uterus it is so well protected that even when the vagina is the seat of a severe injury it usually escapes altogether. When, however, pregnancy occurs the conditions are changed, and, as an abdominal organ, it is exposed to various forms of traumatism. Uterine injuries vary in importance from a simple contusion to a large wound communicating with the peritoneal cavity.

The causes are conveniently divided as follows: (1) Parturition; (2) external violence; (3) internal violence.

Parturition.—The uterus may be ruptured during labor. (See treatise on obstetrics.)

External Violence.—Although injuries from this cause are comparatively rare, still quite a number of cases have been reported where the traumatism had resulted from stabbing, shooting, kicks, blows, and the horns of an animal. Again, the pregnant uterus has been mistaken for a cyst and a trocar plunged into it at the time of performing an abdominal section.

Internal Violence.—This is the most frequent cause. These injuries may occur during an intrauterine operation or result from an attempt to perform a criminal abortion. Under ordinary conditions the walls of the uterus are so firm and resistant that there is but little likelihood of causing an operative injury, but when pregnancy exists or the organ is the seat of malignant degeneration or septic infection the tissues become soft and friable and there is always danger of penetrating into the peritoneal cavity with a curet or a uterine sound. Grave and often fatal injuries have been inflicted upon the uterus in attempting to perform a criminal abortion with a tent, sound, catheter, or bougie, and very extensive wounds have also been caused by women themselves introducing various foreign objects into the uterine cavity for the purpose of ending gestation.

A very interesting case illustrating the methods of professional abortionists occurred in my service at the Medico-Chirurgical Hospital in 1897. The patient upon whom the abortion had been performed was a single woman twenty years of age. The abortionist inserted a tupelo tent into the uterine cavity and instructed her to take hold of the string which was attached and remove it on the following day. This she endeavored to do, but without success, as the tent could not be dislodged. I saw the case for the first time two days after the criminal operation, when her general condition was bad; the temperature was 104° F. and the pulse 146 per minute and very weak. From the hurried history I received of the case I believed her condition to be dependent upon a septic endometritis, and

at once decided to dilate and curet the uterine cavity. Upon introducing my finger into the vagina a loop of string was found hanging from the os uteri. This was easily removed, and after dilating the uterus its cavity was found to be empty, which led at once to the suspicion that the tent had been forced through the uterine wall when it was originally inserted. I had no difficulty in discovering the perforation with a uterine sound. The abdominal cavity was then opened and the pelvis found shut off by recent adhesions which were easily separated. The tent was discovered lying transversely in Douglas's culdesac. Supravaginal hysterectomy was performed, followed by glass drainage. A glance at Fig. 331 will explain why a hysterectomy was done instead of the more simple method of closing the tear. In the illustration the tent is placed in the false passage to indicate the direction and extent of the injury. The tent penetrated the uterine wall at the internal os, passed obliquely upward, and was forced through the serous coat posteriorly just below the left horn of the uterus. The oblique passage thus formed could not be drained into the uterine or cervical canal, and as the uterine walls were already infected hysterectomy was indicated. The patient made a good recovery ("Medical Bulletin," Philadelphia, July, 1897).

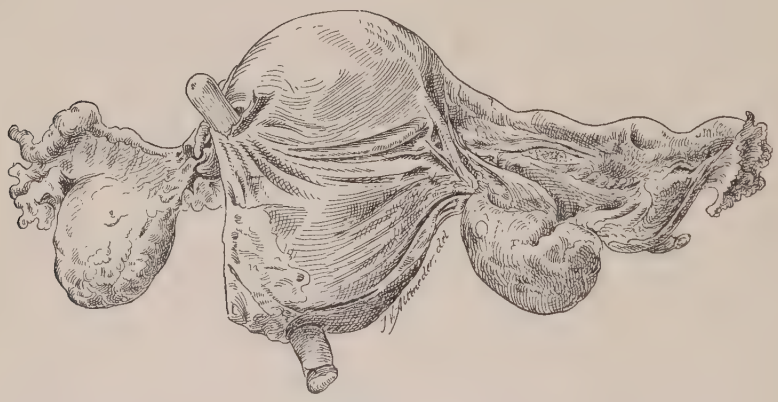


FIG. 331.—UTERUS PERFORATED BY A TUPELO TENT. INCOMPLETE ABDOMINAL HYSTERECTOMY—RECOVERY (AUTHOR'S CASE).

Diagnosis.—In cases due to external violence when the woman is pregnant a positive diagnosis of the injury cannot be made until the uterus is examined after opening the abdomen, as the general and local symptoms are the same in all severe injuries of the abdominal viscera. When the uterus is perforated during an intrauterine operation, the resistance to the instrument suddenly ceases and the operator realizes that the curet or sound has penetrated farther than the normal limits of the uterine cavity. Furthermore, if the abdominal walls are thin the end of the instrument can be readily felt through them.

Injuries caused by criminal abortion can only be suspected by the development of sepsis, but as this symptom is very often due to infection without traumatism we cannot be certain of the diagnosis until the uterine cavity is dilated and examined for the presence of a wound.

Prognosis.—Pregnancy always increases the danger to life in injuries of the uterus. Miscarriage follows, as a rule, and death often results from hemorrhage or septic infection. The extent, situation, and character of the wound must always be considered, as these conditions determine the nature of the operation and the post-operative complications. Thus, for example, some in-

juries only require suturing the torn uterine wall; others, again, give a positive indication for hysterectomy, and, finally, cesarean section may be necessary to save the life of the mother.

Perforation of the uterine wall with a curet or sound during an aseptic operation is seldom followed by bad results, but if the case is septic or the antiseptic preparations have been imperfect infection of the peritoneum is likely to occur and death ensue.

Treatment.—The principles underlying the treatment of penetrating wounds of the abdomen must be applied to injuries of the uterus resulting from stabbing, shooting, or the horns of an animal. It is, therefore, imperative in all cases to make an exploratory incision at once and ascertain the character of the injury without any reference whatever to the probabilities in the case. It is impossible to determine the nature of the injury or the organs involved until the abdomen is opened, when a careful examination will reveal the true conditions and the indications for treatment.

If the uterine wound has not resulted in an extensive loss of tissue, it should be closed with interrupted catgut or silk sutures, otherwise a supravaginal hysterectomy should be performed. In wounds that are treated by suturing the torn walls the question of cesarean section naturally presents itself if the uterus has not been emptied spontaneously either through the natural passages or into the abdominal cavity. If the liquor amnii has not escaped, it is fair to presume that the child has not been injured, and, therefore, cesarean section is not indicated. But if the membranes have been ruptured, the contents of the uterus must be removed through the abdomen before the tear in the uterine wall is closed. If the pregnant uterus is mistaken for a cyst and punctured with a trocar and the membranes ruptured, cesarean section must be performed at once. But if they have escaped injury, the contents of the uterus should be left undisturbed and the wound closed with interrupted sutures.

It is sometimes difficult to decide upon the proper course of treatment in injuries caused by internal violence, and the surgeon is therefore often called upon to exercise more than ordinary judgment in dealing with these cases. If the uterus has been punctured during an operation, nothing should be done except to keep the patient quiet in bed for a week and move the bowels every day with a saline. Rectal enemas should not be employed, as they distend the bowel and displace the pelvic organs, and consequently interfere with healing of the uterine wound. Intrauterine injections are also positively contraindicated, as the fluid may be forced into the peritoneal cavity and set up a septic inflammation. The pulse and temperature must be carefully watched, and if there is the slightest indication of sepsis the abdomen should be opened at once and supravaginal hysterectomy performed. When the intestine or omentum has prolapsed into the uterine cavity, the abdomen should be opened at once, the bowel replaced and thoroughly washed with hot normal salt solution, and the wound in the uterus closed with interrupted sutures. If the case is septic, hysterectomy should be performed; and if the gut has become gangrenous, it should be resected and reunited by an end-to-end or a lateral anastomosis.

FOREIGN BODIES.

Causes.—Foreign bodies are not often found in the uterus. They may, however, be occasionally placed there by design or accident. Various objects used by women to induce abortion have been found in the uterine cavity and operators have forgotten to remove gauze tampons which were placed in the uterus

at the time of an operation. Sometimes an instrument or the nozzle of an irrigator has broken off during an operation; a piece of cotton or gauze has been unintentionally left in the uterus; or the stem of an intrauterine pessary has become separated from the rest of the apparatus and retained as a foreign body.

Symptoms.—The presence of a foreign body causes an acute endometritis which is accompanied by a more or less foul-smelling leukorrheal discharge, and in some cases painful uterine contractions occur as the result of local irritation.

The character of the discharge depends upon the nature of the foreign object. An article which is hard and has a polished surface will simply, for a time at least, increase the normal uterine secretion, while an absorbent object is generally infected at once and the discharge becomes purulent.

Diagnosis.—It is impossible to make a diagnosis before the uterine cavity is dilated and the foreign object found, except where the history of the case gives a definite clue.

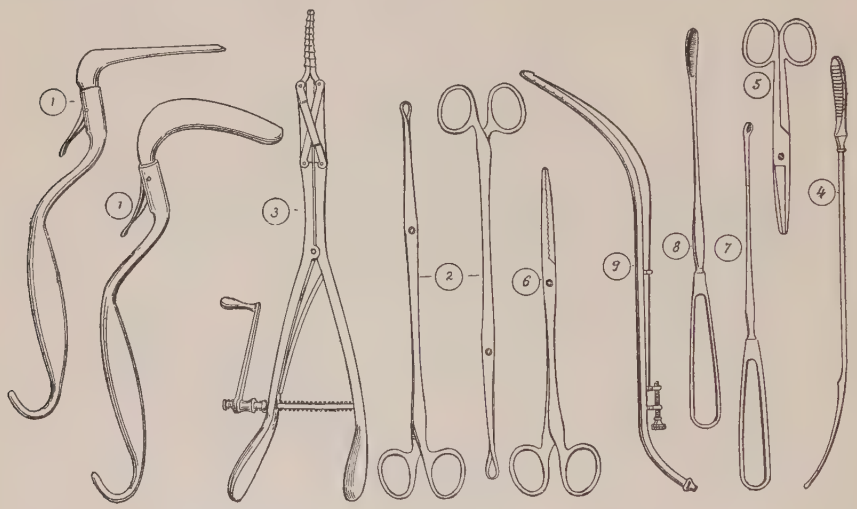


FIG. 332.—INSTRUMENTS USED IN REMOVING FOREIGN BODIES FROM THE UTERUS.

Results.—Septic infection is likely to result and extend to the oviducts. If the foreign object is composed of hard material, it may eventually ulcerate through the uterine walls into the bladder or pelvic cavity. In some cases the walls of the uterus become infected and contain collections of pus.

Treatment.—The indications are to remove the foreign body and treat the complications.

An anesthetic must always be employed except in cases where the foreign body is seen at the os uteri and can easily be withdrawn with forceps without invading the uterine cavity. Whenever it is necessary to dilate and explore the cervical and uterine canals, the strictest antiseptic precautions must be carried out, and this cannot be done unless the patient is under the influence of an anesthetic.

Technic of the Operation.—The Preparation of the Patient and the Preparations for the Operation are described on pages 830 and 831.

Position of the Patient.—Dorsal position.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Instruments.—(1) Simon's speculums (curved and flat blades); (2) two bullet forceps; (3) Goodell's heavy uterine dilator; (4) uterine sound; (5) straight scissors; (6) dressing forceps; (7) Sims's sharp curet; (8) Martin's curet; (9) dilating uterine douche.

Operation.—The uterine cavity is dilated (see p. 955) and the foreign body located with the sound. It is then seized with dressing forceps and carefully extracted. The uterine cavity is finally flushed with a solution of corrosive sublimate (1 to 2000), followed by normal salt solution, and the vagina dried and loosely packed with a strip of gauze. The vulva is then protected with a compress and T-bandage.

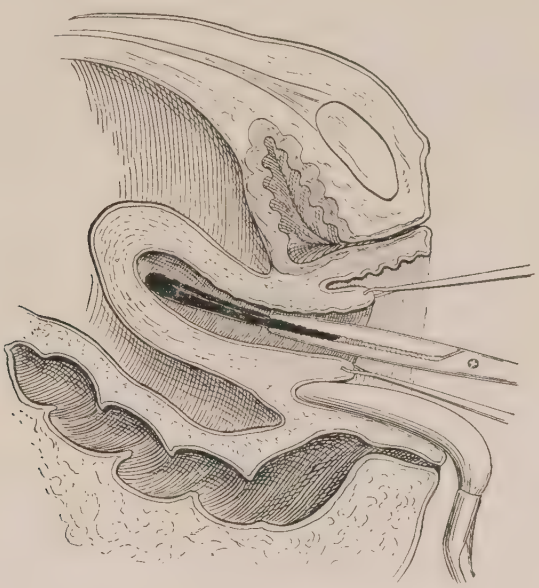


Fig. 333.—Removing a Foreign Body from the Uterus.

Variations in the Technic.—If the foreign substances consist of broken pieces of glass, a careful exploration of the uterine cavity must be made with the sound to avoid the possibility of overlooking some of the fragments and leaving them in the uterus.

Objects which are imbedded in the uterine tissues may require an extensive operation for their removal. Thus, according to Reed, "Mittermaier found it impossible to remove the fragments of broken glass from the cavity of the uterus, to accomplish which he had to divide the uterus from the bladder, draw the fundus down into the vagina, and make an incision into the uterine cavity. Having removed the glass, he stitched up the incision and returned the womb to its normal position."

If septic endometritis has resulted from the presence of the foreign body, the uterine cavity must be cureted (see technic, p. 955), and if the walls of the uterus have become infected, supravaginal hysterectomy (see technic, p. 984) is indicated.

After-treatment.—The after-treatment is fully discussed under the operation of dilatation and curetment of the uterus on page 960.

DISPLACEMENTS.

GENERAL CONSIDERATIONS.

The Normal Position of the Uterus.—Normally the uterus lies between the rectum and the bladder and below the abdominal cavity and above the vagina. Its long axis forms a right angle with the long axis of the vagina, while its fundus touches a point a little above the plane of the superior strait. The uterus is slightly anteflexed with the concavity of the curve facing forward; the anterior surface of the body rests upon the bladder; and the cervix points backward toward the coccyx.

The uterus is not fixed in its position but moves normally within certain limits as it is influenced by various conditions. Thus, the act of respiration imparts to the uterus a continuous *up-and-down* motion, ascending during expiration and descending during inspiration. A full bladder pushes it backward, while an overloaded rectum accentuates its forward position.

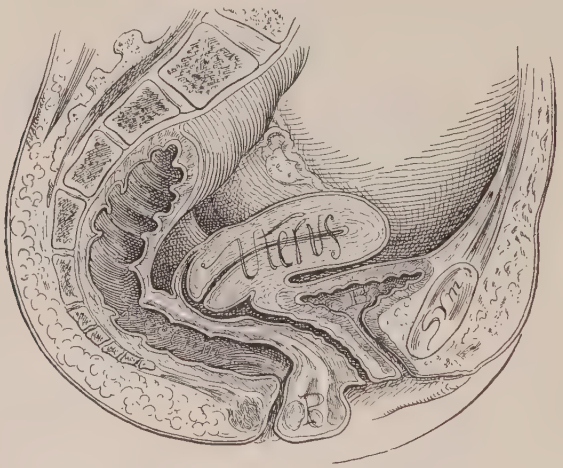


FIG. 334.—NORMAL POSITION OF THE UTERUS.

Again, the abdominal pressure evoked during defecation and urination presses it lower in the pelvis, and, finally, its relations are influenced by the position of the woman, being more depressed and further forward in the erect than in the dorsal recumbent posture.

The Supports of the Uterus.—It is impossible to clearly understand the nature of the influences that are at work by means of which the uterus is suspended in the pelvic cavity unless they are studied as a whole and realizing that no one factor is independent of another, but that the harmonious action of all determines the result. The uterus is held in position by the following forces:

The pelvic floor.
The pelvic organs.
The retentive power of the abdominal cavity.
The ligaments.

The Pelvic Floor.—As the uterus is suspended in the pelvis between the abdominal cavity and the pelvic floor, it naturally follows that the latter contributes to its support. The pelvic floor, therefore, by preserving the position and integrity of all the organs and soft parts of the pelvis indirectly supports the uterus. When the perineum is torn and the vagina is no longer a closed canal, the ab-

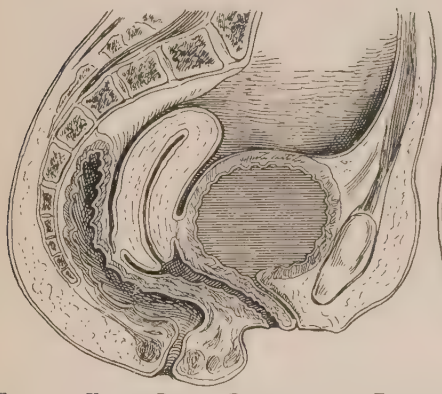


FIG. 335.—UTERUS PUSHED BACKWARD BY A FULL BLADDER.

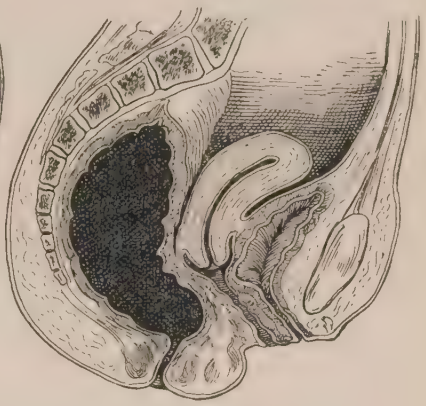


FIG. 336.—UTERUS CROWDED FORWARD BY AN OVERLOADED RECTUM.

dominal pressure acts directly upon the uterus and forces it downward; the bladder loses the support of the anterior vaginal wall and becomes prolapsed, forming a *cystocele;* and, finally, defecation becomes difficult owing to the fact that, the perineal pressure being absent, the feces are not directed toward the anal

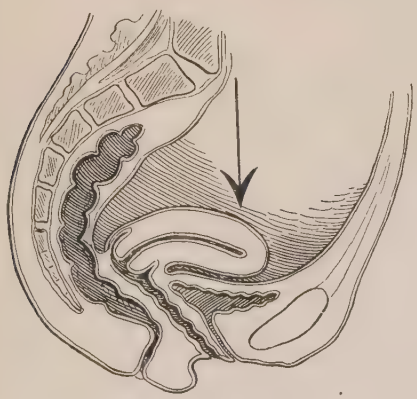


FIG. 337.—Erect Position.

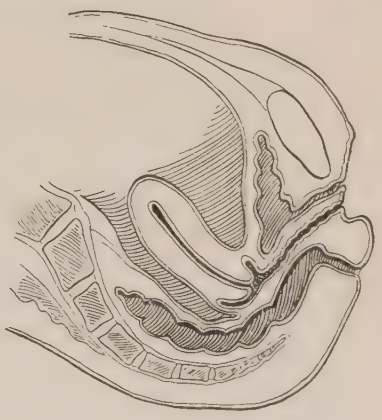


FIG. 338.—Dorsal Position.

EFFECT OF POSITION UPON THE SITUATION OF THE UTERUS.

opening but are forced against the posterior wall of the vagina, which eventually becomes relaxed and forms a *rectocele.* The uterus under these conditions cannot maintain its normal position because the support of the other pelvic organs has been taken away and all the upper structures of the pelvis dragged down by the prolapse of the rectum and bladder. Furthermore, the abdominal

pressure is increased during the acts of urination and defecation and the *retentive power* of the abdominal cavity is impaired by the patulous state of the vulvovaginal orifice.

The Pelvic Organs.—As we have already seen, all the organs of the pelvis act as cushions upon which the uterus rests, and consequently any interference with their normal position or condition results in uterine displacement.

The Retentive Power of the Abdominal Cavity.—The action of the diaphragm influences the position of the uterus by causing it to ascend during expiration and descend during inspiration. These movements stimulate the pelvic circulation and increase the strength of the uterine ligaments, and consequently assist in maintaining the uterus in its normal position.

The Ligaments.—The uterine ligaments are normally relaxed, as their function is not to support the uterus in a certain fixed position, but like a tether rope to confine the organ within certain limits. When the uterus, for any cause, moves beyond these limits, the ligaments then become tense and stop further movement. Thus, abnormal displacements backward are prevented by the round ligaments; downward by the uterosacral ligaments; and laterally and downward by the broad ligaments. While the uterine ligaments are not a con-

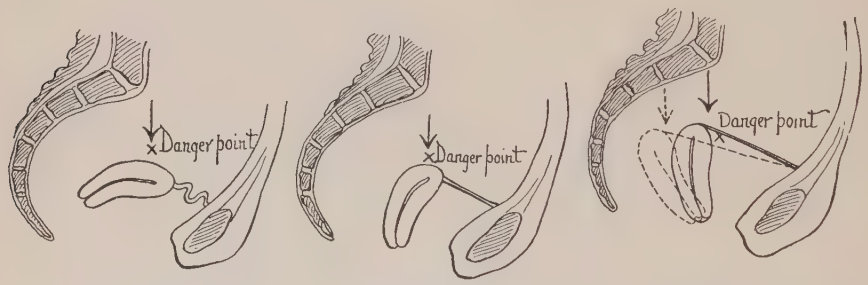


FIG. 339. FIG. 340. FIG. 341.

DIAGRAMS SHOWING THE TETHER-ROPE ACTION OF THE UTERINE LIGAMENTS.
In Fig. 341 the ligaments are elongated and allow the fundus to fall back of the danger-point.

stant support to the uterus, their function as tether ropes is absolutely essential for maintaining its normal position. If for any cause the uterus becomes misplaced backward or downward for a year or more, the ligaments become so overstretched and degenerated that it is impossible for them ever to regain their normal contractility, length, or strength; consequently even if the cause of the displacement is completely removed and the organ placed in its normal position again it will not remain for any length of time, because the tether ropes are too long and too weak to keep it within the danger-point. Normally the abdominal viscera lie against the posterior surface of the uterus, and pressure from above therefore increases the anterior position of the organ by forcing the fundus nearer the symphysis pubis. So long as the abdominal pressure is directed against the posterior surface a backward displacement of the uterus cannot occur, but if the intestines get between the fundus and the bladder then the force from above is applied against the anterior face of the womb and the organ is driven backward. When the ligaments are normal they do not permit the uterus to fall back far enough for this to occur, but if they are elongated or relaxed the backward movement is not controlled and the danger-point is soon reached if the intestines slip between the fundus and the bladder.

Classification.—The uterus may be displaced as follows:

Displacements as a whole.
    Ascent; Descent; Anteriorly; Posteriorly; Laterally.
Displacements in version and flexion.
    Posterior; Anterior; Lateral.
Torsion.
Inversion.

Displacements as a Whole.—By these forms of displacement we mean that the entire uterus changes its position in the pelvic cavity. Thus, for example, if we move a table which occupies the center of a room over against the wall, it is displaced as a whole; but if we tilt it up on two of its legs, only a portion is removed from its original position.

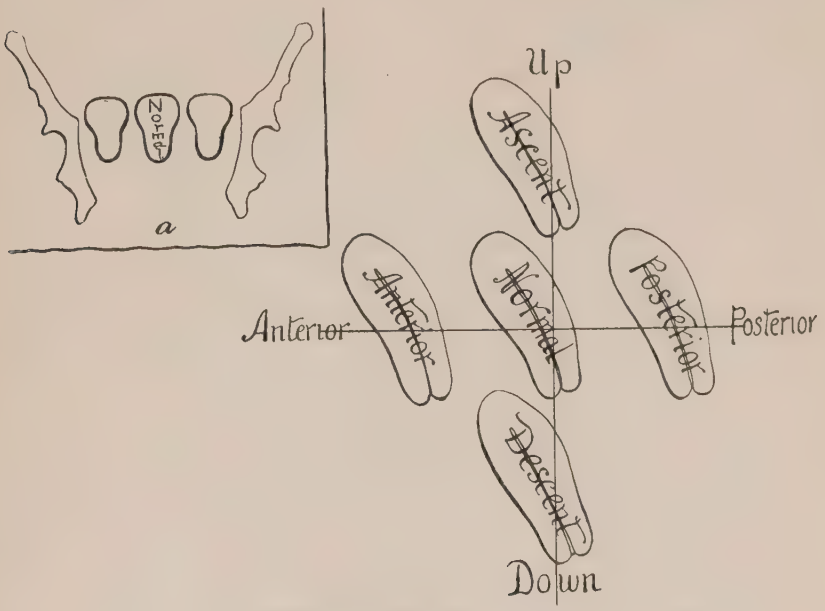


FIG. 342.—DIAGRAMS SHOWING THE DISPLACEMENTS OF THE UTERUS AS A WHOLE.
Diagram *a* shows the lateral displacements.

Displacements in Version and Flexion.—By *version* we mean that the long axis of the uterus has changed its position and that it no longer forms a right angle with the long axis of the vagina. Thus, the fundus may point posteriorly, laterally, or too far anteriorly (Fig. 343). A *flexion* is a bend in the uterus which destroys the normal curve of the uterine canal. Thus, the body of the uterus may be bent so that the fundus points posteriorly, laterally, or too far anteriorly (Fig. 344).

Torsion.—By torsion we mean that the uterus is turned upon its long axis so that one side is more anterior than the other.

Inversion.—An inversion of the uterus is where the organ is turned inside out so that the fundus is pushed through the cervical opening into the vagina (Fig. 345).

While the above classification includes all forms of displacements, it does not give us a practical working basis upon which to consider the subject from the standpoint of treatment, for the reason that many of the malpositions are secon-

dary conditions dependent upon pathologic lesions, and as such they are of no clinical importance as deviations from the normal position of the uterus. Thus, if a displacement is caused by a tumor pushing or adhesions pulling or it is associated with a gross pelvic lesion, the position of the womb becomes a matter of secondary consideration, and the case from the standpoint of treatment is no longer one of

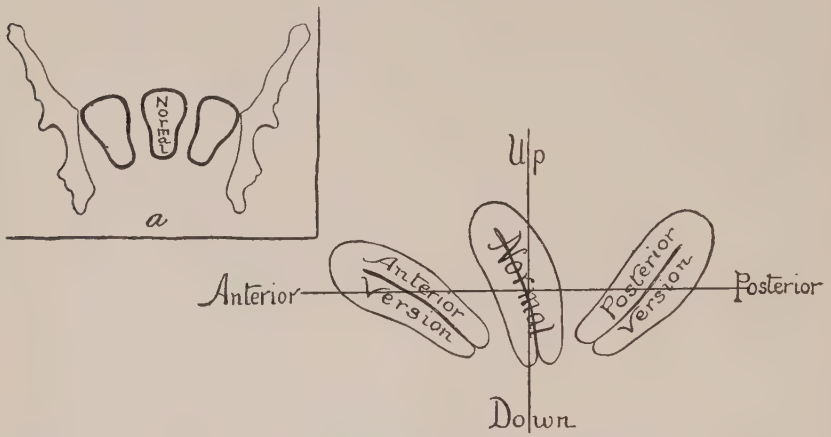


FIG. 343.—DIAGRAMS SHOWING THE DISPLACEMENTS OF THE UTERUS IN VERSION (page 321). Diagram *a* shows the lateral versions.

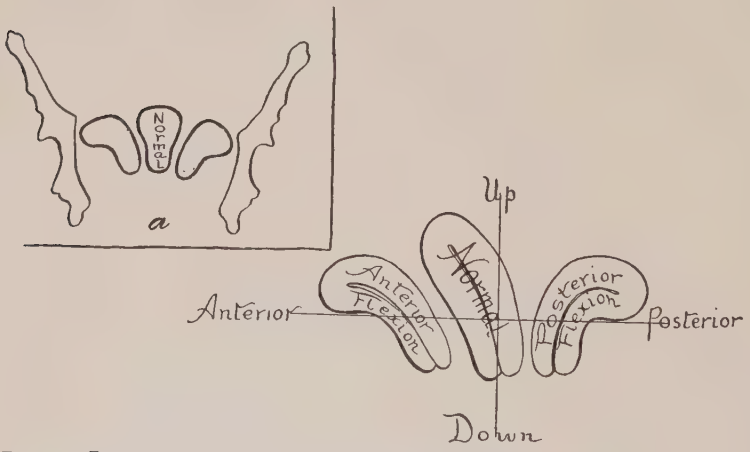


FIG. 344.—DIAGRAMS SHOWING THE DISPLACEMENTS OF THE UTERUS IN FLEXION (page 321). Diagram *a* shows the lateral flexions.

uterine displacement. In considering displacements of the uterus from the standpoint of treatment I separate those which are of *primary* from those which are of *secondary* importance and dependent upon a local lesion. Viewed, therefore, in the light of this classification my conception of the consideration of uterine displacements narrows itself down to the discussion of only those malpositions which are of *primary* importance. The fact that a primary retro-displacement becomes adherent to the pos-

terior pelvic peritoneum does not make it of secondary importance, because the adhesions under these circumstances are not the cause but merely one of the results of the malposition. When, on the other hand, the uterus is dragged posteriorly by tubo-ovarian disease and it becomes adherent along with the diseased uterine appendages, then the displacement is clearly a secondary condition, and as such it is of no importance from the standpoint of treatment.

I classify displacements of the uterus from the standpoint of treatment as follows:

Primary Importance.—(1) Displacements as a whole (descent or prolapse); (2) Anterior flexions; (3) Posterior versions and flexions; (4) Inversions.

Secondary Importance.—(1) Displacements as a whole (ascent, posteriorly, anteriorly, laterally); (2) Anterior versions; (3) Lateral versions and flexions; (4) Torsions.

The uterus may be displaced as a whole in an anterior, a posterior, or a

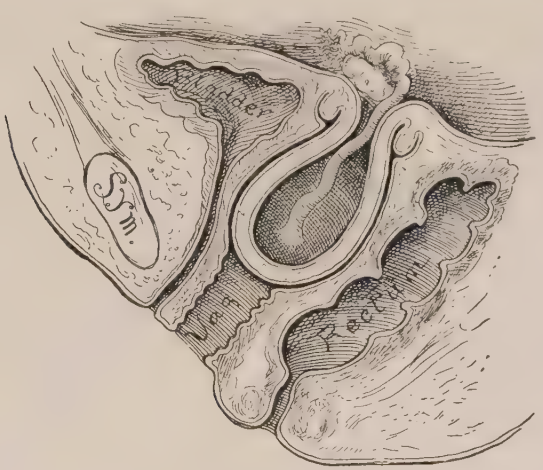


Fig. 345.—Inversion of the Uterus (page 321).

lateral direction. Again, there may be descent or ascent of the organ. All of these displacements with the exception of descent or prolapse are of secondary importance, being due to gross pelvic lesions or to adhesions. The uterus may be displaced by version or flexion in an anterior, posterior, or lateral direction. These displacements are all of primary importance except the lateral versions and flexions and anterior versions, which are, as a rule, caused by pelvic lesions. Torsions of the uterus are always secondary to a pelvic lesion, while inversions are classified under those displacements which are of primary importance from the standpoint of treatment.

In considering this classification it should be borne in mind that the displacements of primary importance may be secondary at times if they are associated with a pelvic lesion. Thus, for example, a posterior version or flexion may be due to tubo-ovarian disease or a partial inversion may be caused by a uterine polyp. On the other hand, however, displacements of secondary importance are never primary because they are always due to a pathologic lesion.

PROLAPSE.

Definition.—Prolapse of the uterus is sinking or falling of the organ below its normal level in the pelvis. The extent of a prolapse varies from a slight falling of the womb to its complete escape through the vulvovaginal orifice. So long as the uterus remains within the vagina the displacement is spoken of as an *incomplete prolapse* or *descensus uteri*, but when the organ has escaped through the vaginal opening it is known as *complete or true prolapse* and as *procidentia*.

Pathology.—The pathologic changes which occur in cases of prolapse depend upon the extent of the displacement. When the prolapse is slight the uterus is below its normal level in the pelvis and somewhat retroflexed and its long axis is nearly in a line with the long axis of the vagina. In more pronounced cases the uterus is still lower in the pelvic cavity and the cervix is close to the vulvovaginal orifice. There is also more or less bulging of the posterior and anterior vaginal walls—*rectocele* and *cystocele*—and the uterine ligaments are relaxed.

Complete prolapse or *procidentia* is accompanied with marked changes in all

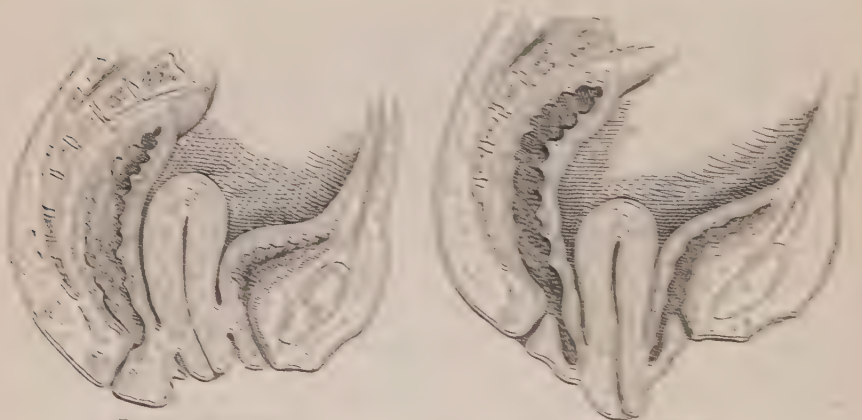


FIG. 340.—Incomplete. FIG. 341.—Complete.

PROLAPSE OF THE UTERUS.

the organs and structures of the pelvis. When the patient is in the erect posture or when she bears down, the uterus escapes through the vulvovaginal orifice and hangs between the thighs supported by the vaginal walls and the uterine ligaments. In some cases it becomes hypertrophied as the result of some inflammatory changes and remains permanently outside of the vagina or it may suddenly become enlarged from an acute edematous swelling. The uterine mucous membrane frequently becomes thickened, and in cases of long standing it is not uncommon to find that the uterus has become atrophied. The cervix becomes elongated and hypertrophied and is often the seat of ulceration. The elongation of the cervix, which is evidently due to traction, often increases the length of the uterine canal several inches, which is, however, greatly lessened when the uterus is reduced. In some instances the mucous membrane of the cervical canal is everted. The vagina is turned inside out and hangs supported by its lower attachments. The culdesac of Douglas and the vesico-uterine fold of peritoneum follow the vagina in its descent and pass outside of the vulvovaginal orifice along with the uterus. There is also a prolapse of the anterior wall of the rectum and

the posterior wall of the bladder, forming a *rectocele* and *cystocele*. The vaginal epithelium becomes dry, thickened, and horny by being exposed to the air and friction of the clothing and thighs in walking. In some instances the continued irritation causes irregularly shaped ulcers to appear at different points on the exposed vaginal walls. The prolapse of the anterior vaginal wall displaces the urethra and bladder and urination becomes more or less difficult and incomplete. The uterine ligaments are elongated, relaxed, and degenerated, and act only as attachments to the prolapsed uterus. If the broad ligaments become twisted, the ureters may be obstructed and cause a temporary *hydronephrosis*, or a *varicocele* may result from interference with the circulation. The peritoneal culdesacs in front of and behind the prolapsed uterus usually contain a coil of intestine and the uterine appendages.

Causes.—The causes of prolapse and of posterior displacements of the uterus are the same, and to save repetition the reader is referred to page 339 for a full discussion of the subject.

Symptoms.—The symptoms of prolapse come on gradually and depend upon the extent of the displacement. In slight cases of uterine descent they do not differ materially from those caused by posterior displacements, but in complete prolapse the symptoms are aggravated and the patient suffers great inconvenience. Some women, however, go about for years with a total prolapse of the uterus without any annoyance whatever except the mechanic inconvenience of the womb hanging between the thighs.

FIG. 348.—COMPLETE PROLAPSE OF THE UTERUS WITH DESCENT OF COILS OF THE INTESTINE.

The symptoms are considered under the following headings:

Backache.	Menstruation.
Pelvic symptoms.	Conception; Pregnancy.
Rectal symptoms.	Headache.
Bladder symptoms.	Digestive disturbances.
Leukorrhea.	Nervous symptoms.

Special symptoms.

Backache.—This is a common symptom. The pain is usually felt over the lumbosacral region as a dull heavy ache, which is more or less relieved when the patient lies down, but which is increased in severity by the erect posture, walking, heavy work, and exercise.

Pelvic Symptoms.—There is generally a feeling of weight or pressure in the pelvis which is aggravated by the erect posture and violent exercise. The patient often describes her sensations as bearing-down or dragging in character. Pain frequently radiates from the inguinal regions down the thighs.

Rectal Symptoms.—The rectal symptoms are caused by the rectocele or prolapse of the anterior wall of the rectum which results in difficult defecation, chronic constipation, hemorrhoids, and a tendency to inflammation of the lower bowel. In slight cases of prolapse the pressure of the uterus upon the rectum

causes constipation and a sensation of fullness in the bowel which is not relieved by defecation.

Bladder Symptoms.—It is rare for the bladder to be affected in slight cases of prolapse. When the displacement is associated, however, with a well-marked cystocele or prolapse of the posterior wall of the bladder, symptoms of vesical irritation may result from the residual urine, and it may also be difficult for the patient to empty her bladder without great effort unless she first replaces the prolapsed organ with the fingers or urinates while upon her hands and knees.

Leukorrhea.—Congestive endometritis is always present. The discharge is non-irritating in character and its color varies from a white to a whitish-yellow hue. Septic infection of the endometrium is very rare notwithstanding the exposure of the cervical canal.

Menstruation.—There is usually a tendency to menorrhagia, which is caused by the congestion of the uterus and hypertrophy of the endometrium. In some cases, on the other hand, there are no disturbances whatever in the menstrual function. As a rule, the menopause is somewhat delayed.

Conception; Pregnancy.—While prolapse of the uterus is frequently a cause of sterility, yet it is only relatively so, as women often conceive and go to full term without any bad symptoms even in cases of procidentia. The displacement always recurs after confinement.

Headache.—Pain on the top of the head or over the occiput is a common symptom. In the majority of cases it is more or less constant, while in others it occurs only at the time of the monthly periods.

Digestive Symptoms.—In some cases the digestive symptoms are marked, while in others they may be entirely wanting. They are usually characterized by a loss of appetite, gastric and intestinal indigestion, nausea, and constipation. The general health eventually suffers and the patient becomes thin and anemic as the result of impaired nutrition.

Nervous Symptoms.—Neurasthenia is a frequent symptom of prolapse of the uterus. The motor and sensory phenomena are varied in character. The patient is unable to take active exercise on account of loss of muscular strength and an utter lack of desire to exert herself.

Special Symptoms.—In cases of complete prolapse walking and active exercise are often prevented by the uterus and vagina hanging between the thighs and the pain resulting from the irritation of the ulcerations on the cervix and vaginal walls.

Causes and Symptoms of Acute Prolapse.—Sudden prolapse of the uterus is a rare condition. It has been observed in the parous and in the nulliparous woman; in women during the puerperal state; and in those suffering with pelvic tumors. It is caused by a sudden and extraordinary muscular effort, such as heavy lifting, or a fall from a height. In all likelihood the uterosacral ligaments are ruptured, whereas in chronic prolapse they gradually become elongated.

The symptoms are characterized by shock and severe expulsive pelvic pains; there is also a sensation of something having been violently torn within the pelvic cavity. Urination may be interfered with or complete retention may result. The uterus and vagina are deeply congested, and become edematous in a short time if the displacement is not corrected.

Diagnosis.—The examination should be made with the patient in the erect posture, as gravity and intra-abdominal pressure force the displaced structures down and reveal the true position of all the organs. In the dorsal position, on the other hand, it is easy to overlook a slight descent of the uterus, a rectocele or cystocele, or even a total prolapse unless the patient displaces the organs by bearing down.

Incomplete prolapse is recognized by *vaginal touch* combined with *abdominal palpation*. The index-finger of the left hand is introduced into the

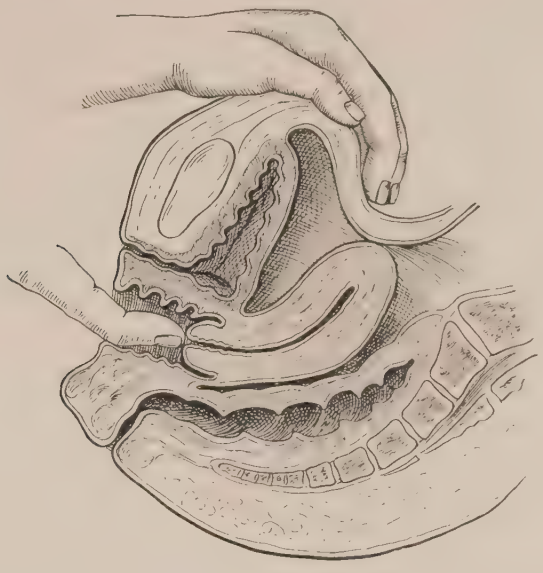


FIG. 349.—DIAGNOSIS OF AN INCOMPLETE PROLAPSE OF THE UTERUS BY VAGINO-ABDOMINAL TOUCH.
Showing the position of the cervix and the fundus of the uterus.

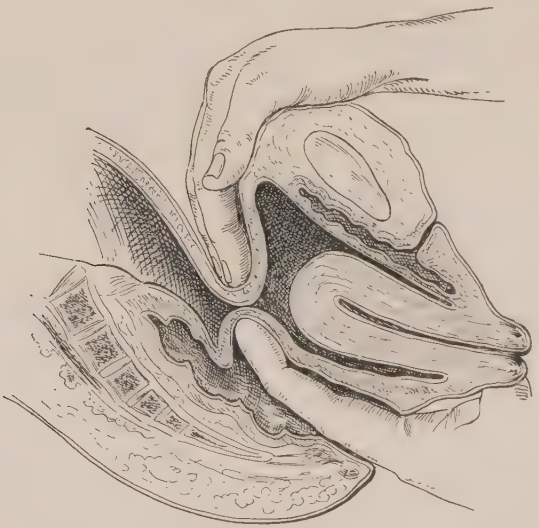


FIG. 350.—DIAGNOSIS OF A COMPLETE PROLAPSE OF THE UTERUS BY RECTO-ABDOMINAL TOUCH (page 328).
Showing the marked descent of the fundus in the pelvic cavity.

vagina to determine the position of the cervix. It is found to be lower in the pelvis than normal and pointing forward in the direction of the long axis of the vagina. The tip of the finger is now placed against the end of the cervix to steady

it while the fingers of the right hand palpate over the lower abdomen to determine the position of the fundus, which is found to be retrodisplaced and lower than normal in the pelvis.

Complete prolapse or procidentia is recognized by *sight* and *touch*. The uterus and vagina are found protruding beyond the vulvovaginal orifice or hanging between the thighs, and external palpation combined with rectal touch demonstrates the marked descent of the uterus in the pelvic cavity (Fig. 350).

The apparent lengthening of the cervix which occurs in prolapse and which is due to the vaginal vault being pulled down closely against the supravaginal cervix as the uterus descends disappears at once when the patient is placed in the knee-chest position and a speculum is introduced into the vagina. Under these circumstances the uterus falls back into the pelvic cavity, the tension upon the vaginal vault is relieved, and the structures unfold themselves and restore the cervix to its normal length.

Differential Diagnosis.—Complete prolapse may be mistaken for

Fig. 351.

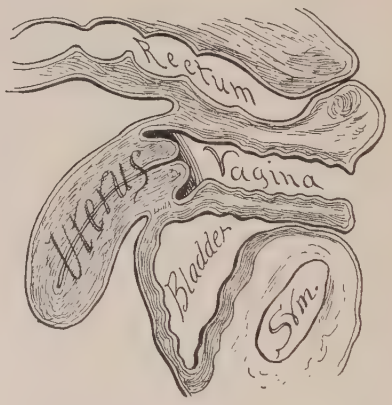


Fig. 352.

Diagnosis of Prolapse of the Uterus.

Fig. 351 shows apparent lengthening of the cervix in prolapse of the uterus; Fig. 352 shows disappearance of the apparent elongation of the cervix when the patient is placed in the knee-chest position.

inversion of the uterus, cervical polypus, and hypertrophic enlargement of the cervix.

In *inversion of the uterus* the cervix forms a distinct ring completely around the protruding mass, and at no point of the circumference of the tumor will a sound pass into the uterine cavity. Again, the appearance of the inverted fundus in no way resembles the cervix, and finally recto-abdominal touch demonstrates the absence of the fundus of the uterus and the presence of a cup-shaped depression above the cervix.

In *cervical polypus* a sound will pass into the uterine cavity at all points of the circumference of the collar formed by the cervix except where the growth is attached unless abnormal adhesions exist. Rectal touch combined with abdominal palpation shows that the uterus is in its normal position.

In *hypertrophic enlargement of the cervix* the vault of the vagina is not obliterated as in prolapse; the fundus of the uterus is in its normal position; and the length of the cervix is not decreased as in uterine descent when the patient is placed in the knee-chest position.

Prognosis.—Prolapse of the uterus usually destroys a woman's health and comfort. Death may occur in rare instances from obstruction of the ureters or from gangrene of the prolapsed organ. Good results are generally obtained from treatment.

Treatment.—A slight descent of the uterus is always associated with a posterior displacement, and hence the treatment will be considered under retropositions on page 346.

The treatment of pronounced cases of prolapse will be discussed under the following headings:

The preparatory treatment.
The removal of the cause.
Permanent replacement of the uterus.

The Preparatory Treatment.—Nothing whatever should be attempted in the way of a radical plan of treatment until the patient's general health and local conditions are placed in the best possible state. Careful preparatory treatment results in reducing the size of the uterus and vagina; decreases the length of the

FIG. 353.—MANUAL REPLACEMENT OF A COMPLETE PROLAPSE OF THE UTERUS.

elongated cervix; cures the ulcerations caused by friction and irritating discharges; and relieves to a marked extent the passive congestion of the parts. In other words, the perineum, the vagina, and the uterus must be prepared for the subsequent radical operations.

The preparatory treatment is divided as follows into:

Replacing the uterus.
Temporary replacement of the uterus.
Vaginal injections.
Pelvic massage.
Treatment of ulceration and diseased conditions of the cervix.
General treatment and hygiene.

Replacing the Uterus.—There is usually no difficulty whatever in replacing the uterus in cases of complete prolapse unless the organ is enlarged from chronic congestion or hypertrophy or it is swollen and edematous as the result of acute strangulation. In uncomplicated cases the patient is placed in the knee-chest position, after thoroughly evacuating the rectum and bladder; and

the uterus grasped by the fingers of the left hand and gently pushed in the direction of least resistance until the displaced structures glide back into the pelvic cavity. The position of the patient materially aids in the replacement of the uterus by relieving the intra-abdominal pressure and causing all the organs to fall toward the upper part of the abdominal cavity (Fig. 353).

When the uterus is enlarged by chronic congestion or edema due to strangulation, the patient is placed in the knee-chest posture for fifteen minutes to decrease the amount of blood in the pelvic organs. The uterus is then grasped with the fingers of the left hand and compressed for ten or fifteen minutes longer and pushed back into the pelvis. In some cases it may be necessary to administer an anesthetic and use some force in replacing the organ. Again, cases of acute edema often require compression for several hours with an elastic bandage, which is applied directly around the uterus and vagina. In some cases the application of hot-water fomentations or lead-water and laudanum are all that is required to control the swelling and lessen the size of the uterus.

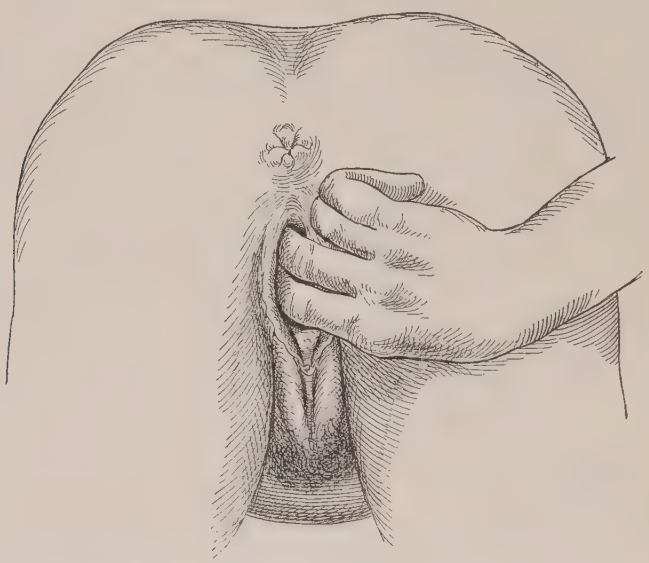


FIG. 354.—TEMPORARY REPLACEMENT OF A PROLAPSED UTERUS BY THE PATIENT HERSELF IN THE KNEE-CHEST POSITION.

Temporary Replacement of the Uterus.—This is a very essential part of the preparatory treatment, as it relieves the congestion and reduces the size of the uterus and vagina. There are two methods which are employed to keep the uterus in position—the *tampon* and the *knee-chest posture.*

The *tampon* is introduced with the patient in the knee-chest posture and consists of a strip of plain gauze sufficiently long to pack the vagina snugly and keep the uterus in position. It is secured, if necessary, by a vulvar compress and T-bandage, and reapplied daily.

While the *knee-chest posture* is not, of course, like the tampon, a direct support to the uterus, yet it serves a most useful purpose in the treatment by relieving the engorgement of the pelvic vessels and temporarily replacing the organs. The patient should, therefore, be instructed to assume this posture for ten minutes three times a day and shown how to separate the margins of the vaginal orifice

with the index and middle fingers in order to admit the air and balloon out the vagina.

Vaginal Injections.—Vaginal douches of hot normal salt solution should be given daily by the physician or nurse when the tampon is reapplied or they should be employed night and morning by the patient herself in cases where tamponading of the vagina is not employed.

Pelvic Massage.—Massage of the pelvic organs is indicated in these cases to relieve the engorgement of the blood-vessels and should be given only by a nurse who thoroughly understands the technic.

Treatment of Ulcerations and Diseased Conditions of the Cervix.—Ulcerations of the cervix and vagina which occur from friction and irritating discharges are usually relieved by keeping the uterus in position and employing tampons and douches of hot normal salt solution. If, however, they are sluggish or slow in healing, a stimulating ointment should be applied, such as carbolated benzoated oxid of zinc ointment (3 per cent.), or one containing iodoform, and the granulating surfaces painted twice a week with a solution of nitrate of silver (gr. xxx to f℥j).

The treatment of cystic degeneration of the cervix and eversion of the cervical mucous membrane is discussed on page 454.

General Treatment and Hygiene.—Careful attention must be given to outdoor and indoor exercises, rest, diet, and bathing; the bowels must be kept regular; the bladder must not be allowed to become distended; the clothing must not constrict the patient's waist; and a properly adjusted abdominal bandage must be worn to increase the retentive power of the abdomen (Fig. 850). The general health of the patient should also be considered and the constitutional treatment regulated to meet the indications in each case.

The Removal of the Cause.—After the preparatory treatment has been carried out for six or eight weeks and the pelvic structures have been placed in a good condition, the surgical causes of the displacement should be considered and appropriate operative measures instituted. Thus, it may be necessary to repair a laceration of the perineum or cervix; perform an anterior or posterior colporrhaphy; amputate the neck of the uterus; or curet the endometrium.

Permanent Replacement of the Uterus.—In considering the best means to permanently replace the uterus after carrying out the preparatory treatment and removing as far as possible the causes of the displacement, we must bear in mind that it is not only the womb which is prolapsed but also the vagina, the rectum, the bladder, and other structures of the pelvis, and that the normal attachments of these organs have been destroyed. It naturally follows, therefore, that any form of support which will keep the uterus and the other pelvic organs in a relatively normal position must act from above by fixation or from below by elevation. The methods by which the womb is held in position are therefore either operative or mechanic.

Operative Methods.—These are:

Ventral fixation of the uterus.

Supravaginal hysterectomy followed by fixation of the cervical stump to the abdominal wall.

Ventral Fixation of the Uterus.—The object of this operation is to make a firm and lasting union between the anterior abdominal wall and the fundus of the uterus by means of which the womb, the vagina, the rectum, and the bladder are pulled up and kept in a relatively normal position. In other words, the uterus is

hung upon a hook sufficiently high to take the slack or prolapse out of the pelvic structures which are attached to it.

This is the best operation in my opinion for the permanent relief of cases of prolapse which are not complicated by a uterine tumor. It must be remembered that the resulting union between the abdominal wall and the uterus is very firm, and if pregnancy subsequently occurs there is great likelihood of abortion or premature labor occurring, or, if the patient goes to full term, of dangerous obstacles presenting themselves to the delivery of the child. I therefore make it

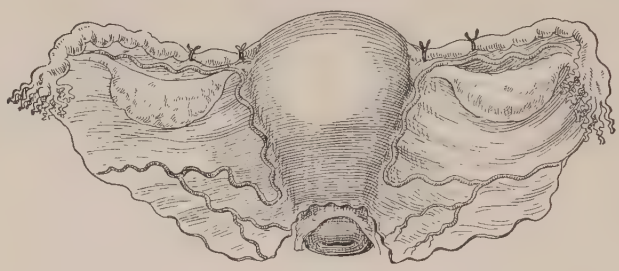


FIG. 355.—VENTRAL FIXATION OF THE UTERUS—**First Step.**

a rule never to perform the operation, except in women who have passed the menopause, without first rendering the patient sterile by ligating each Fallopian tube in two places in order to insure permanent occlusion of both oviducts, and consequently I frequently resort to mechanic means for holding up the uterus in women who desire children.

TECHNIC OF THE OPERATION.—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 834 and 837.

Position of the Patient.—Trendelenburg.

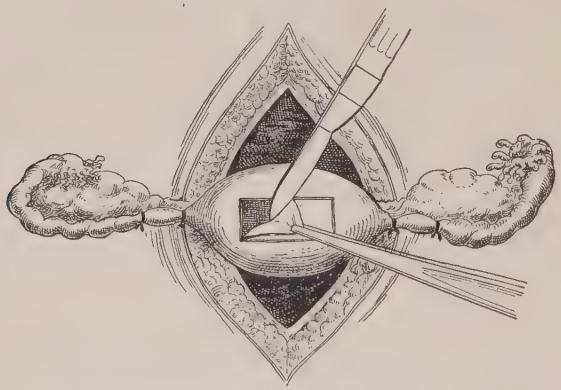


FIG. 356.—VENTRAL FIXATION OF THE UTERUS—**Second Step.**
The forceps seizing the Fallopian tubes are not shown.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Instruments.—The list of instruments is the same as in the operation of salpingo-oöphorectomy, which is described on page 973.

OPERATION.—FIRST STEP.—The uterine appendages are delivered as in the operation of salpingo-oöphorectomy (see p. 974) and both Fallopian tubes ligated as shown in the illustration. (The ovaries are not removed if they are healthy.)

If the patient has passed the menopause, the second step of the operation becomes the first, and we proceed at once to denude the fundus of the uterus without ligating the tubes.

Second Step.—The Fallopian tubes are seized with long-bladed hemostatic forceps and the uterus drawn into the abdominal incision. A space one inch long and half an inch wide is then marked out on the fundus by superficial in-

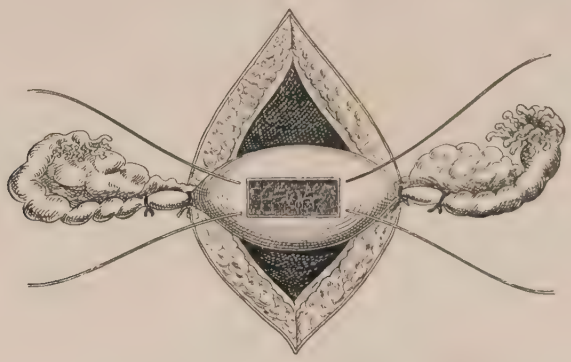


Fig. 357.—Ventral Fixation of the Uterus—Third Step.

cisions with the scalpel and the intervening peritoneum dissected off, leaving a raw approximation surface.

Third Step.—Two silkworm-gut sutures are passed from one side of the fundus to the other under the denuded area; the forceps removed from the tubes, and the uterus is temporarily allowed to fall back into the pelvic cavity.

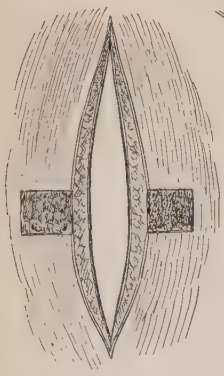


Fig. 358.—Fourth Step.

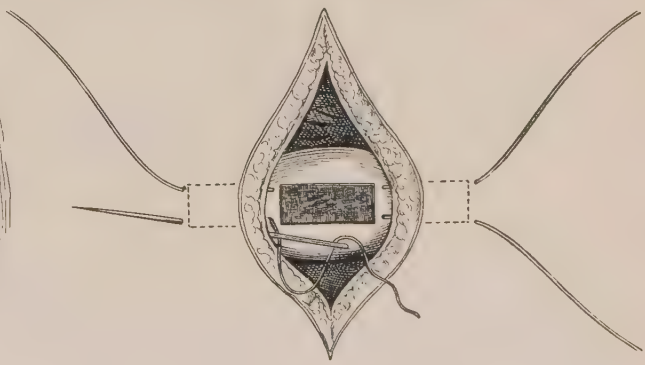


Fig. 359.—Fourth Step.

Ventral Fixation of the Uterus.

Fig. 358 shows the areas of parietal denudation on each side of the abdominal incision. Fig. 359 shows the fixation sutures being introduced through the abdominal wall. The dotted lines indicate the areas of parietal denudation.

The sutures are introduced with a curved Hagedorn needle and buried about one-quarter of an inch deep in the uterine tissue. They enter close to the edge of the divided peritoneum and pass completely under the denuded area to emerge at the same point on the opposite side.

Fourth Step.—A strip of parietal peritoneum half the size of the raw surface on the fundus is removed with scissors on each side of the abdominal incision

near its lower angle and the free ends of the fixation sutures passed completely through the walls of the abdomen, so that when they are tied the denuded uterine and abdominal areas will be in contact (Figs. 358 and 359).

Fifth Step.—The abdominal wound is sutured and closed in the usual manner (see p. 904).

The operator then makes traction upon the free ends of the fixation sutures and brings the fundus of the uterus in close contact with the denuded area on the under surface of the abdominal wall. The sutures are now tied and the wound dressed in the usual manner (see p. 905).

After-treatment.—The fixation and abdominal wound sutures are removed on the eighth day.

Supravaginal Hysterectomy followed by Fixation of the Cervical Stump to the Abdominal Wall (Baldy's Operation).—This operation was devised by Baldy,

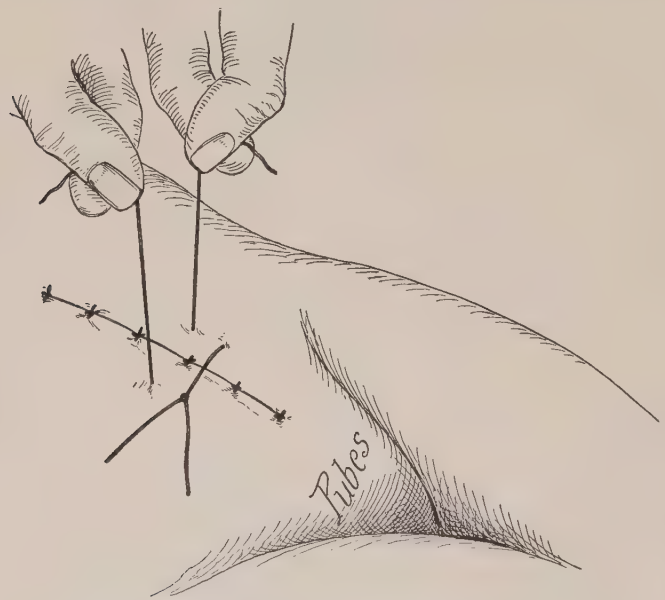


Fig. 360.—Ventral Fixation of the Uterus—**Fifth Step.**
The lower fixation suture is shown tied and traction is being made upon the upper suture.

who says it "is to be chosen when a very large amount of relaxation exists and the vaginal vault would not otherwise be lifted up sufficiently high to give the requisite support." I cannot agree with this indication for the operation, because a ventral fixation can easily be made high enough on the abdominal wall to take up any amount of slack or prolapse of the pelvic organs, and also for the reason that a hysterectomy is too serious an operation to perform for the relief of a uterine displacement. The only indication, therefore, in my opinion for the operation is when the prolapse is associated with a fibroid tumor of the uterus, and under these circumstances I consider Baldy's method a distinct advantage.

The technic of the operation is as follows: "After the uterus has been removed by amputation at or below the internal os the cervical stump is fixed to the abdominal wall at the lower angle of the abdominal incision by means of two silkworm-gut sutures passed through the full width of the cervix from side to side,

and the free ends brought through the peritoneum, muscles, and deep fascia of the abdominal wall, where they are securely tied together, cut off short, and the knots buried when the incision is closed. The open broad ligaments should be closed by a continuous catgut suture on each side, preferably before the cervix is anchored by its fixation sutures. The abdominal wound is then closed in the usual manner." ("An American Text-Book of Gynecology," page 329, second edition.)

In employing this technic I do not bury the fixation sutures, but pass them completely through the abdominal wall, as in the operation of ventral fixation, and it is also better, in my judgment, to denude the under surface of the abdominal wall where it comes in contact with the cervical stump; otherwise the support may be weakened by the peritoneum stripping.

Mechanic Methods.—These are: (*a*) Pessaries; (*b*) colpeurynters; and (*c*) tampons.

Mechanic supports are resorted to when operative measures are contraindicated on account of the advanced age of the patient or the state of her health, and they should also be employed when a woman desires to have children or she is unwilling to submit to radical methods.

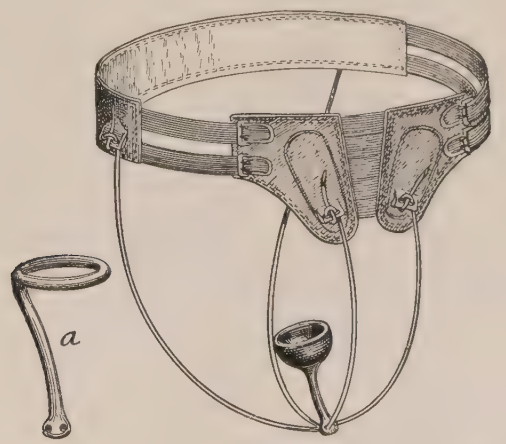


Fig. 361.—Cup or Ring (*a*) Pessary with External Support.

Pessaries.—A cup or ring pessary with an external support is the only instrument which will elevate the uterus and hold it in position. An ordinary pessary should never be used, as it cannot support the organs and is eventually forced out of the vagina.

The pessary should be removed at bedtime and whenever the patient assumes the recumbent posture for any length of time. It should be carefully cleansed with soap and water and thoroughly dried. A vaginal douche of hot normal salt solution should be used night and morning and once a week the vagina should be irrigated with warm water and soap.

Colpeurynters.—Braun's colpeurynter is a very effective instrument for retaining the uterus in position and may be used when a pessary cannot be worn on account of causing pain or fails to hold the organs in position. The colpeurynter should be removed when the patient goes to bed at night and the vagina irrigated twice a day with normal salt solution. The instrument should be carefully cleansed and the rubber bag covered with zinc ointment each time it is introduced into the vagina to prevent the parts from becoming abraded (Fig. 362).

Tampons.—A cotton-wool tampon is an excellent means to keep the pelvic organs elevated and is especially indicated in the treatment of prolapse in very old women. The tampon should be large enough to give the necessary amount of support and it should be dusted over with tannin, alum, subnitrate of bismuth, or boric acid alone or in combination. It should be removed at bedtime and the vagina irrigated with normal salt solution night and morning.

Treatment of Acute Prolapse.—The patient is placed at once in bed, the uterus restored to its normal position by the means already described on page 329, and the vagina loosely packed with iodoform or sterile gauze. The urine must be voided spontaneously or drawn with a catheter every eight hours and the

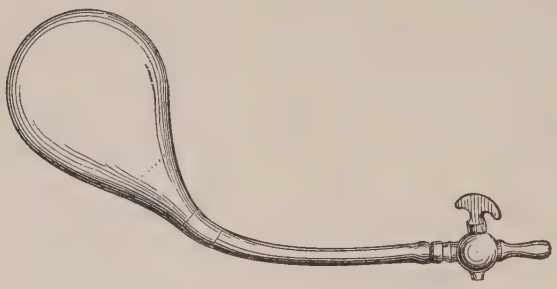


FIG. 362.—BRAUN'S COLPEURYNTER (page 335).

bowels freely moved with a saline. If the pain is severe, a hypodermic injection of morphin should be given. The patient must remain constantly in bed for at least three weeks and she should not be allowed to lie much of the time upon her back. A fresh tampon should be introduced once a day and the vagina irrigated night and morning with hot normal salt solution.

The tampon and douches are continued for two or three months after the patient gets out of bed, and heavy lifting or violent exercise of any kind should be avoided.

If the displacement persists after several months' treatment, it should be considered as a chronic condition and treated accordingly.

ANTEFLEXION.

Description.—During fetal life and in early childhood there is a sharp angle between the cervix and the body of the uterus, and the lower uterine segment is relatively larger than the upper. This condition of anterior flexion is, in a lesser degree, normal during adult life, and the anteversion which also exists places the uterus at a right angle with the long axis of the vagina. The fixation of the cervix by the uterosacral ligaments and the constant pressure of the abdominal viscera upon the posterior surface of the uterus are important factors in producing the normal position of the organ. Anterior flexions are never pathologic except they cause dysmenorrhea, endometritis, or sterility, or they are associated with a pelvic lesion and become of secondary importance. An anterior displacement, therefore, is not a true deviation but an exaggeration of the normal position of the womb.

Frequency.—Anteflexion of the uterus is a very common form of displacement and is met most frequently in women who have never borne children.

Causes.—But little is known of the true nature of the causes of anteflexion of the uterus in women who have not borne children. Probably the condition is a continuation of the sharp anterior flexion which normally exists during intra uterine life and childhood. But why this arrest of development should occur in some women and not in others we do not know, as sharp flexions are often observed in women having well-developed physiques and otherwise normal generative organs. In another class of cases, however, the anteflexion is accompanied with an infantile uterus and other evidences of an undeveloped condition of the genital organs.

Anteflexions are rare in women who have borne children, and when they do occur they are puerperal in origin. Thus, the uterus may be tilted abnormally forward by contraction of the uterosacral ligaments and its walls softened by subinvolution. Under these conditions the pressure of the abdominal viscera may easily bend the fundus forward and produce a well-marked flexion.

Symptoms.—The chief symptoms of anteflexion of the uterus are: (*a*) Dysmenorrhea; (*b*) sterility; and (*c*) leukorrhea.

Fig. 363.—Anteflexion of the Uterus.

Dysmenorrhea.—The menstrual pain is due to an obstruction of the cervical canal which is caused by the flexion and the swollen or hypertrophied condition of the endometrium. This form of dysmenorrhea is known as the obstructive variety and is described on page 721.

Sterility.—Anteflexion does not always cause sterility and women often become pregnant after suffering for years with severe obstructive dysmenorrhea. But the tendency is, however, for these women not to become pregnant, on account of the structural changes in the endometrium produced by the chronic endometritis which accompanies and is caused by an anteflexion of long standing.

Leukorrhea.—The bending of the uterus upon itself mechanically interferes with the circulation, and in time a passive congestion occurs which eventually results in a chronic congestive endometritis. The leukorrheal discharge which accompanies this disease is non-irritating in character, whitish in color, and more or less profuse, especially just before and immediately after the menstrual flow.

Diagnosis.—The patient is placed in the dorsal position and the diagnosis made by *vagino-abdominal touch.*

The index-finger of the left hand is introduced into the vagina and the cervix palpated to determine its position, which is usually found to be normal, although in some instances it may be strongly flexed and point directly forward. The finger is then pushed up into the anterior culdesac of the vagina and counter-pressure made with the fingers of the external hand immediately above the symphysis pubis. The fundus is easily felt between the opposing fingers and at once recognized by its shape and consistency.

The examination so far has demonstrated that the uterus is in an anterior or normal position, and the next step is to discover the flexion. This is readily done by keeping up the external counter-pressure from above while the tip of the internal finger is slowly passed over the anterior face of the uterus from the fundus to the cervix and the shape of the line between the two points noted.

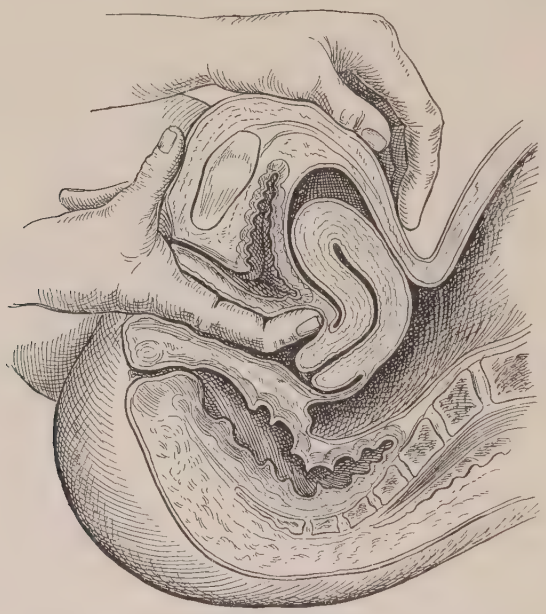


FIG. 364.—DIAGNOSIS OF ANTEFLEXION OF THE UTERUS BY VAGINO-ABDOMINAL TOUCH. Showing position of fundus and point of flexion.

Knowing what the normal curve of the uterus should be, it is an easy matter to determine whether a flexion exists and to recognize the sharpness and situation of the angle.

Prognosis.—Anteflexion associated with an infantile uterus is incurable. When the displacement, however, occurs in a uterus of normal size, the prognosis is very favorable if the proper surgical treatment—*dilatation and curetment of the uterine cavity*—is carried out. This operation cures about 80 per cent. of the cases of obstructive dysmenorrhea and benefits the remainder; it restores the endometrium to its normal condition; and pregnancy frequently follows even in flexions of long standing.

The beneficial results following dilatation and curetment of the uterus are generally not apparent at the first menstrual flow after the operation, and pain is

usually felt at that period. The subsequent menstrual epochs, however, are generally characterized by improvement in the symptoms, and the pain finally disappears.

Women suffering with anteflexion often become pregnant sooner or later after marriage if the endometrium has not undergone chronic structural changes, and if gestation goes to full term the uterine lesion is permanently cured.

Treatment.—The treatment is operative and consists in dilatation and curetment of the uterine cavity. The technic and the after-treatment of the operation are described on pages 955 and 960.

Special Directions.—The operation should be performed about one week after the menstrual flow stops.

After the uterine cavity has been cureted and flushed it should be tightly packed with a strip of gauze, which is allowed to remain for two days in order to keep up the dilatation and prevent the flexion from recurring.

The patient should remain in bed for one week after operation and at the end of fourteen days she may be allowed to leave her room.

When the operation is performed for sterility, coitus should take place a day or two before and immediately after menstruation for several successive months.

If the operation is not followed by the relief of symptoms, it should be repeated once or twice before giving an unfavorable prognosis.

POSTERIOR VERSIONS AND FLEXIONS.

Definition.—By *retroversion* we mean that the uterus turns upon its transverse axis and tilts the fundus backward and the cervix forward. The normal curve of the uterine canal is not changed and its concavity always faces anteriorly, but the long axis of the uterus no longer forms a right angle with the vagina. A retroversion frequently exists alone, although it is not uncommon to find it associated with a retroflexion. A posterior version is always associated with some prolapse, as the uterosacral ligaments must become more or less elongated before the cervix can be displaced and carried forward (Fig. 365).

A *retroflexion* of the uterus is a bending of the organ backward upon itself so that the fundus points posteriorly while the cervix, theoretically, remains in its normal position. The curve of the uterine canal is altered and its concavity always faces posteriorly. As a matter of fact, it is impossible for a retroflexion to occur without some degree of version, and consequently marked examples of both forms of posterior displacements often coexist in the same case (Fig. 366).

Frequency.—Posterior displacements are much more frequent than any other form of uterine dislocation. They are more common in parous than in nulliparous women, and in the latter versions occur more often than flexions. Congenital retrodisplacements of the uterus are very rare. The atrophied uterus after the menopause is usually displaced backward.

Causes.—The normal situation of the uterus depends upon the integrity of its supports, and it naturally follows that any condition which impairs or destroys these forces is a cause of displacement. The conditions are, therefore, classified as follows:

Those which destroy the supporting power of the pelvic floor.
Those which impair the sustaining action of the pelvic organs.
Those which weaken the retentive power of the abdomen.
Those which interfere with the strength of the uterine ligaments.

As the conditions affecting the various supports of the uterus usually involve more than one at the same time, it is evidently impossible to consider them separately, and consequently they will be discussed as a whole. I shall, more-

over, consider the subject only from the standpoint of primary displacements, ignoring entirely the etiology of cases which are secondary to pelvic lesions, and consequently no mention will be made of pelvic tumors, adhesions, tubo-ovarian diseases, and other gross conditions which incidentally push or pull the womb out of its normal situation. If, for example, a large pelvic tumor crowds the uterus against the sacrum, the displacement is a mere incident, and of no importance from the standpoint of treatment. It is the tumor, not the malposition of the uterus, which concerns the surgeon and his patient, and the *diagnosis*, *prognosis*, and *treatment* are based solely upon the presence of the new-growth. It should also be borne in mind that in certain cases the destruction of one of the uterine supports so interferes with the equilibrium of all the forces that they, in turn, are affected and the causes of the displacement become general.

FIG. 365.—Version.

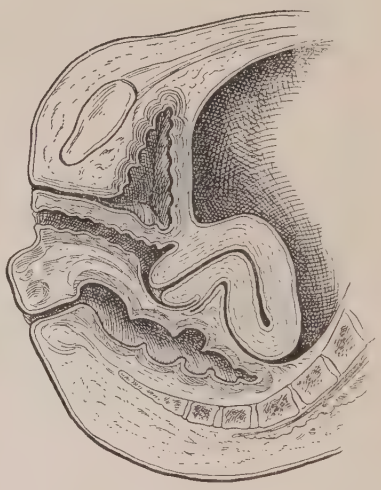


FIG. 366.—Flexion.

POSTERIOR VERSION AND FLEXION OF THE UTERUS (page 339).

For example, a laceration of the perineum not only impairs the power of the pelvic floor, but secondarily the pelvic organs lose their sustaining action and the force of the retentive power of the abdomen and the uterine ligaments is weakened. On the other hand, however, one of the supports may be affected without in any way involving the rest, and thus a heavy subinvoluted uterus may cause a displacement by stretching and weakening the uterine ligaments without affecting all the other sustaining forces.

The following causes produce the conditions which are responsible for retrodisplacements of the uterus:

Laceration or Relaxation of the Tissues of the Pelvic Floor Due to Labor or Accident.—The traumatisms of labor are the most frequent cause of posterior displacements. When the perineum is ruptured, defecation is rendered difficult and extra force is required to empty the rectum. This is due to the fact that normally the levator ani assists in dilating the sphincter and directing the feces toward the anal opening. When, therefore, the pelvic floor is torn, the

opposing force of the levator ani is absent and the fecal matter is driven by the abdominal pressure against the posterior wall of the vagina before passing through the anal opening. This eventually results in the formation of a *rectocele*, and the posterior vaginal wall then pulls upon the cervix and drags down the uterus and the structures in the upper part of the pelvis. The tendency to constipation in these cases, due to blunting of the rectal reflexes by the constant presence of fecal matter in the bowel, is an additional cause of displacement, and, again, the bulging of the posterior vaginal wall destroys the support of the anterior wall, which in time also becomes prolapsed. Thus the bladder, the vagina, the rectum, and the upper structures of the pelvis no longer assist in supporting the uterus, and while it is held in position for a time by its ligaments, they, however, gradually become more and more elongated and stretched, until finally the womb is dislocated backward and downward. The uterosacral ligaments, on account of their greater resisting power, are the last to give way and become elongated. Moreover, the equipoise of the uterus within the pelvic cavity being destroyed, the retentive power of the abdomen is impaired and the *up-and-down* motions of the organ either cease altogether or are greatly diminished.

Rapidly succeeding pregnancies are very apt to cause a relaxed condition of all the pelvic structures, including the uterine ligaments, and are therefore an important factor in the etiology of backward and downward displacements.

Abnormally Roomy Pelvis.—When the pelvic cavity is abnormally capacious, the pelvic organs do not lie in close apposition, and consequently there is a lack of mutual support which results in more or less sagging and loss of sustaining power to the uterus. The ligaments under these circumstances become elongated, and in time the uterus sinks permanently lower in the pelvic cavity.

Overdistention of the Bladder and Rectum.—When the bladder is distended, the fundus of the uterus is pushed back toward the sacrum, and the round and uterosacral ligaments become taut. In women who are careless in emptying the bladder the ligaments gradually become more and more elongated until finally the fundus passes the danger-line and the intestines crowd down upon the anterior face of the uterus and a permanent posterior displacement results.

During defecation the cervix is always temporarily pushed forward and downward, and an overloaded bowel due to chronic constipation produces the same results; the difference, however, being that the cervix resumes its normal position immediately after defecation, whereas an accumulation of feces, by its constant mechanic pressure, keeps the uterosacral ligaments taut until the fecal mass is expelled, which in some cases occurs only once or twice a week, and consequently the constant tension permanently elongates or weakens the ligaments and causes a posterior displacement of the uterus.

Increased Weight of the Uterus.—The uterine ligaments fail to act as tether-ropes when the uterus is abnormally heavy, because nature has endowed them with sufficient strength to resist only a certain fixed amount of traction, and when this is exceeded, for any considerable length of time, they become elongated, weakened, and undergo degenerative changes. The temporary stretching to which the ligaments are normally subjected during the physiologic actions of the body does no harm because the tension is quickly relieved and they regain at once their normal tonicity; but when the overstretching is indefinitely prolonged, they lose their elasticity and remain permanently relaxed. Subinvolution of the uterus following labor or miscarriage is therefore a common cause of posterior displacements. In addition to the increased size of the uterus the subinvoluted condition of the vagina and uterine ligaments which is usually present in these cases must also be considered as a causative factor. Under these circumstances the vagina is

weakened and its walls are apt to become prolapsed and the elongated and hypertrophied ligaments allow too much freedom of motion to the uterus.

Improper Manner of Dressing.—Tight corsets constrict the abdominal cavity and act injuriously upon the organs of the thorax, the abdomen, and the pelvis (see page 139). Respiration is interfered with and consequently the retentive power of the abdominal cavity is impaired, and the uterine ligaments and the pelvic circulation are no longer strengthened by the *up-and-down* motions of the womb which normally accompany expiration and inspiration. Moreover, the compressed abdominal viscera force the pelvic organs and uterus downward and thus permanently stretch the uterine ligaments. Heavy clothing worn suspended from the waist has the same effect upon the pelvic organs as tight corsets (see page 139).

Lying upon the Back too Long after Confinement.—One of the most frequent causes of posterior uterine displacements is the common habit among obstetricians of keeping their patients in the dorsal recumbent posture after confinement. The heavy uterus, with its hypertrophied and elongated ligaments, and the relaxed condition of the tissues of the pelvic floor, must of necessity fall backward of its own weight under the circumstances, and consequently when convalescence is established the woman leaves her bed with a permanently retrodisplaced and prolapsed uterus (see page 141).

The Use of a Tight Abdominal Bandage after Labor.—The custom of applying a tight bandage after confinement is a common cause of posterior displacements, as it forces the enlarged and heavy uterus back against the sacrum and permanently stretches the uterine ligaments. A tight bandage is, of course, indicated in cases of postpartum hemorrhage, but it should not be worn longer than twenty-four hours.

Muscular Effort.—When the bladder and rectum are overdistended, a sudden muscular effort, such as lifting a heavy weight, jumping from a height, or violent straining, may produce a sudden descent of the pelvic organs and cause a retrodisplacement of the uterus.

Occupation.—Posterior displacements of the uterus are often observed in women whose work requires them to remain standing continuously for hours at a time, and who are more or less careless in emptying the bladder and rectum. Again, women who work sitting at a bench or a table with the body bent forward are likely to suffer eventually from displacements, as this position crowds the abdominal viscera against the pelvic organs and forces the uterus backward (see p. 137).

Posture.—An incorrect posture in standing, walking, or sitting may in time cause a posterior displacement of the uterus. If a woman stands erect in the proper position, the line of gravity falls at the symphysis pubis; but when she stoops somewhat, it strikes about the center of the plane of the pelvic inlet, and consequently the full weight of the abdominal contents presses against the organs of the pelvis (see page 117).

General State of the Health.—Downward and backward displacements of the uterus are frequently met in women suffering from general debility due to habits, occupation, old age, and disease. Under these conditions the pelvis loses some of its fatty and cellular tissue and there is a want of tone and elasticity in the uterine ligaments, and the general muscular weakness which results causes a decided lessening of the retentive power of the abdomen. In cases of chronic lung disease the intra-abdominal pressure is increased by the persistent coughing, and consequently the ligaments of the uterus, which have already lost some of their resisting power on account of the general state of the system, are unable to stand the additional strain put upon them.

Symptoms.—The local and general symptoms of posterior displacements of the uterus are due to mechanic pressure, reflex pains, and interference with the pelvic circulation. It should always be borne in mind that a well-marked posterior displacement may be present in some cases without giving rise to any subjective symptoms whatever.

The symptoms are conveniently discussed under the following headings:

Backache.	Menstruation.
Pelvic symptoms.	Conception; Pregnancy.
Rectal symptoms.	Headache.
Bladder symptoms.	Digestive disturbances.
Leukorrhea.	Nervous symptoms.

Backache.—This is one of the most common symptoms. The pain is generally felt over the lumbosacral region, and while it varies in intensity, it is usually characterized by a dull heavy ache which is increased in severity by the erect posture but is more or less relieved while the patient is lying down.

Pelvic Symptoms.—The pelvic symptoms are very constant. The patient usually complains of a feeling of weight or a dragging sensation in the pelvis; there is also acute pain when the uterine appendages are prolapsed along with the displaced uterus; and not infrequently pains radiate from the inguinal regions down the anterior part of the thighs.

Rectal Symptoms.—The pressure of the fundus of the uterus upon the rectum blunts the rectal reflexes and gives rise to constipation and hemorrhoids. There is also a constant sensation of fullness in the bowel, which is not entirely relieved by defecation. All of the symptoms are aggravated if the uterus becomes adherent.

Bladder Symptoms.—It is rare for the bladder to be affected in posterior displacements of the uterus. In extreme cases, however, of retroversion it is possible for vesical irritation to result from the long-continued pressure of the cervix, and there may also be more or less incontinence of urine due to the dragging of the displaced organ upon the urethra and bladder.

Leukorrhea.—A leukorrheal discharge due to congestive endometritis is a very frequent symptom. It is profuse, as a rule, and often causes an erosion of the cervix. The discharge is seldom irritating to the external organs and its color varies from a white to a whitish-yellow.

Menstruation.—Excessive menstruation or menorrhagia is often observed, and is due to uterine congestion and hypertrophy of the endometrium. Dysmenorrhea is seldom a symptom of retrodisplacement of the uterus, and in cases in which it is present the pain is congestive rather than obstructive in character.

Conception; Pregnancy.—While posterior displacements are frequently a cause of sterility, yet they are only relatively so, as women frequently conceive and go on to full term without any bad symptoms, the uterus spontaneously becoming replaced during the early months of pregnancy. If the uterus is firmly adherent, however, gestation is interrupted and abortion or incarceration occurs. Normally the cervix occupies the posterior culdesac of the vagina, and it is bathed in the seminal fluid after sexual intercourse, and consequently when it assumes an anterior position in retroversion it is more or less difficult for the spermatozoa to reach the os uteri. This is undoubtedly an important factor in the causation of sterility in these cases, as conception frequently occurs shortly after the uterus has been replaced and held in position by an operation or a pessary.

Headache.—Pain on the top of the head or over the occiput is a very common symptom. It varies in intensity and duration, and in the majority of cases is more or less constant, while in others it occurs only at the time of menstruation or is aggravated by the monthly periods.

Digestive Symptoms.—In some cases the digestive disturbances are marked by loss of appetite, gastric and intestinal indigestion, nausea, and constipation. The general health of the individual suffers and she eventually becomes thin and anemic as the result of impaired nutrition.

Nervous Symptoms.—Neurasthenia is a most important and constant manifestation of posterior displacements of the uterus. The symptoms are naturally varied and there is nothing characteristic in their grouping to indicate the cause. The motor symptoms, as a rule, are marked, and some patients are unable to take active exercise on account of muscular weakness, and the lumbosacral and pelvic pains. The sensory phenomena are constant, but vary both as to the character and severity of the symptoms. Most patients complain of a tired feeling and an utter lack of desire to exert themselves. Less frequently they complain of a dull aching pain in the back and thighs, or they may suffer from headache, vertigo, and numbness of the lower extremities. An increase in the frequency of

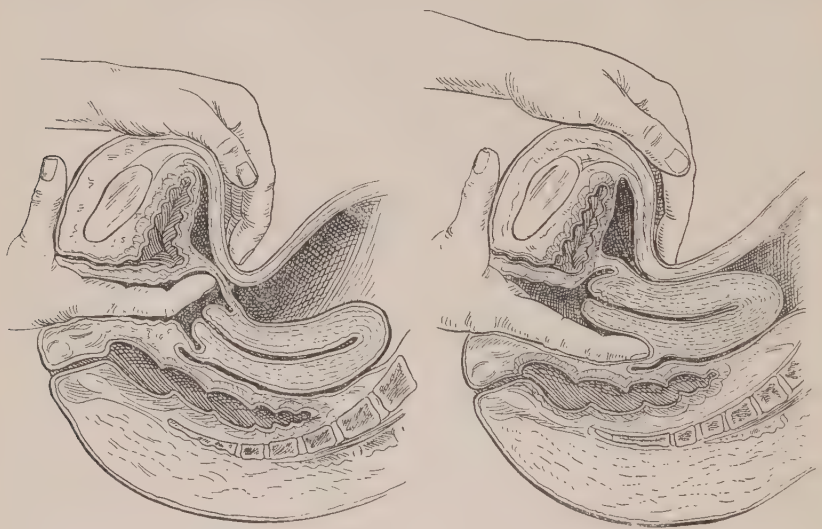


Fig. 367. Fig. 368.

Diagnosis of Posterior Versions of the Uterus by Vagino-abdominal Touch.
Fig. 367 shows absence of fundus anteriorly; Fig. 368 shows presence of body posteriorly.

the heart-beat is a more or less constant symptom, but attacks of cardiac palpitation, however, are rare.

Diagnosis.—The patient is placed in the dorsal position and the diagnosis made by *vaginal* and *vagino-abdominal touch*.

Posterior Version.—Introducing the index-finger of the left hand into the vagina, the cervix is found to be lower than normal in the pelvis and pointing forward, instead of backward toward the coccyx. As the normal position of the fundus is anterior, it should be sought for first in that position by pushing the index-finger up into the anterior culdesac of the vagina while counter-pressure is made with the fingers of the external hand through the abdominal wall immediately above the symphysis pubis. If the fundus is in its normal position, it will be readily felt between the opposing fingers and at once recognized by its shape and consistency. Not finding the uterus anteriorly, it is then sought for posteriorly by carrying the internal finger up into the posterior culdesac of the

vagina while counter-pressure is made from above through the abdominal wall by pushing the structures down along the curve of the sacrum with the fingers of the external hand. The fundus is thus caught between the opposing fingers and easily recognized. Still keeping up counter-pressure from above, the tip of the internal finger is slowly passed over the posterior surface of the uterus from the fundus to the cervix, and the shape of the line between the two points noted. If this line is convex, the uterus is displaced in version, because the normal curve of the uterine canal is not changed, as its concavity still faces anteriorly.

Posterior Flexion.—The same methods are used in the examination as in cases of version. The shape of the line between the fundus and the cervix on the posterior face of the uterus is concave, because the curve of the uterine canal is altered and its concavity always faces posteriorly in retroflexions. While theoretically the cervix retains its normal position, yet as a matter of fact posterior flexions are always associated with more or less version, and consequently the neck of the uterus points somewhat forward.

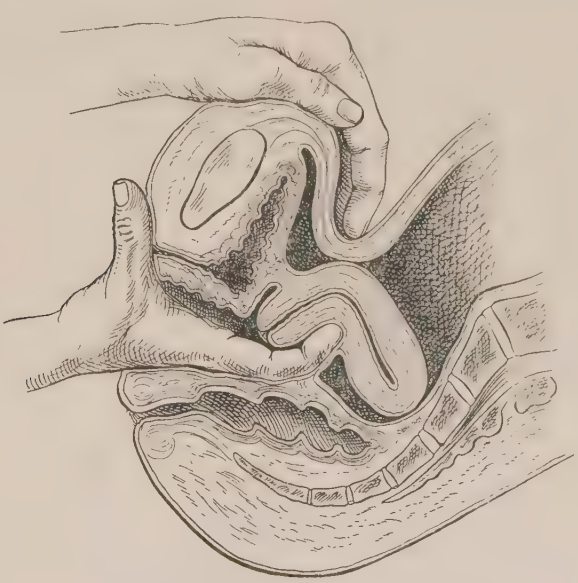


FIG. 369.—DIAGNOSIS OF POSTERIOR FLEXION OF THE UTERUS BY VAGINO-ABDOMINAL TOUCH. Shows the finger in the angle of flexion posteriorly.

Differential Diagnosis.—A retrodisplacement must be distinguished from a fibroid nodule on the posterior wall of the uterus, an accumulation of feces in the rectum, an extrauterine gestation sac, a gross tubo-ovarian lesion, and a subperitoneal growth.

The diagnosis depends upon locating the fundus of the uterus, which is always pushed more or less forward by the retrouterine mass and is recognized by its shape and consistency as well as the unmistakable continuity of structure existing between it and the cervix. Rectal and recto-abdominal touch should also be employed in making the examination, as these methods of palpation usually define or outline the post-uterine enlargement and assist materially in clearing up the diagnosis (Fig. 370).

Prognosis.—Primary posterior displacements of the uterus are only indirectly dangerous to life by their debilitating effect upon the general health and

nervous system, rendering the patient less able to resist intercurrent diseases. A large number of so-called cases of nervous prostration or neurasthenia which cause chronic invalidism and general debility are due to posterior displacements of the uterus.

Treatment.—From the standpoint of treatment I divide all primary posterior displacements of the uterus into—

Recent cases.
Chronic cases.

Recent Cases.—By recent cases we mean those which have been displaced less than one year. The practical necessity for this division lies in the fact that after the uterus has been displaced for over one year the tissues and ligaments have become so overstretched, separated, and degenerated that it is impossible for them ever to regain their normal contractility and sustaining powers, and consequently all forms of local, mechanic, or general treatment, which at times cure a recent case, are absolutely useless after these changes have taken place. It is, therefore, apparent, if success is to result from the treatment of posterior displacements of the uterus, that the length of time the lesion has existed be taken into consideration.

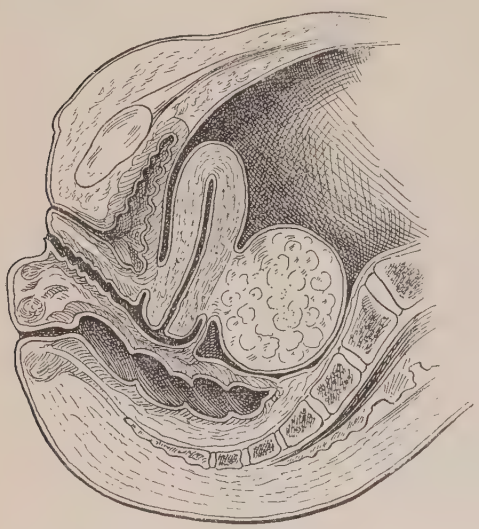


FIG. 370.—DIAGNOSIS OF POSTERIOR DISPLACEMENTS OF THE UTERUS (page 345).
Showing a fibroid nodule in the posterior uterine wall simulating a retroflexion.

The treatment of a recent case should be continued for at least twelve months, and if at the end of this period the ligaments have not regained their normal sustaining powers, the displacement must be regarded as a chronic one and treated accordingly.

The treatment is considered under the following headings:

Removal of the cause.
Replacement of the uterus.
Keeping the uterus replaced.
Reduction of the size of the uterus and stimulation of its ligaments.
General treatment and hygiene.

Removal of the Cause.—Tears in the perineum, pelvic floor, and cervix must be repaired; cervical lesions treated; and if an endometritis is present, the uterine cavity must be cureted.

Replacement of the Uterus.—After the causes of the displacement and the injuries to the soft parts of the pelvis have been removed the next step is to replace the organ in its normal position. Two methods are employed for this purpose, the *bimanual method*, and *replacement of the uterus in the knee-chest position.*

Bimanual Method.—It is difficult to replace the uterus by this method in very fat or muscular women.

The technic is as follows: The bladder and rectum are emptied; the clothing loosened; and the patient placed in the dorsal position.

First Step.—The index and middle fingers of the left hand are introduced

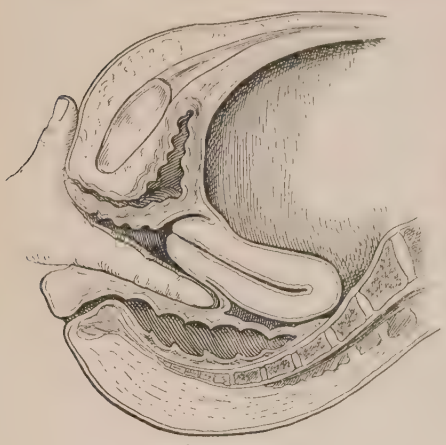


Fig. 371.—First Step.

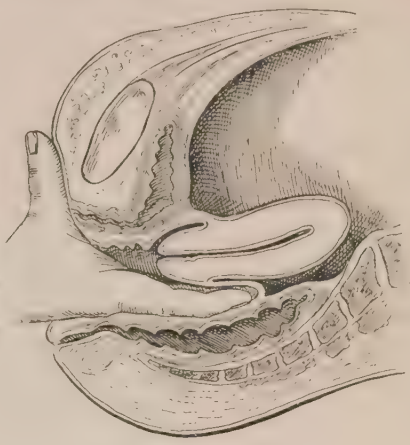


Fig. 372.—First Step.

Bimanual Replacement of a Retrodisplaced Uterus.

into the vagina and the displaced fundus pushed up to the promontory of the sacrum.

Second Step.—As soon as the fundus is on a level with the promontory the

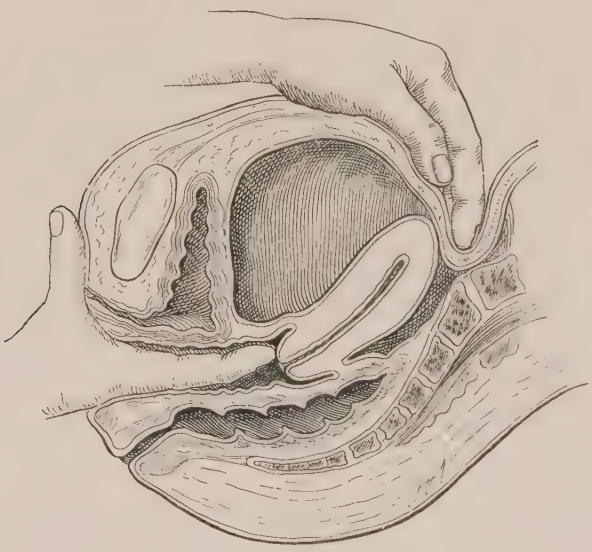


Fig. 373.—Second Step.

Bimanual Replacement of a Retrodisplaced Uterus.

fingers of the right hand crowd the abdominal wall behind the uterus, which is thus held in position, while the internal fingers are placed against the anterior lip of the cervix and push it upward and backward.

THIRD STEP.—The pressure upward and backward on the cervix is continued and the uterus is pulled forward into position with the external fingers.

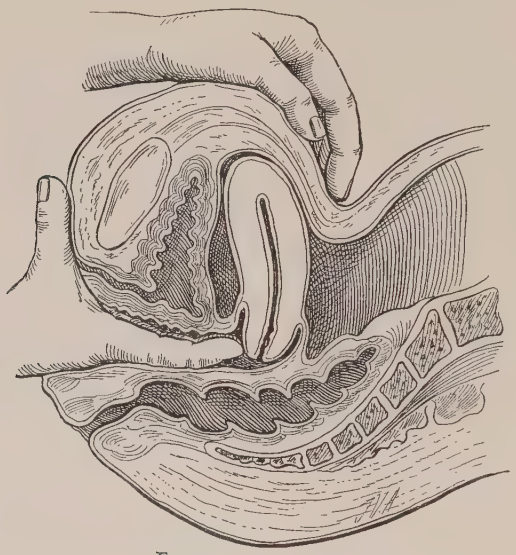


FIG. 374.—Third Step.
BIMANUAL REPLACEMENT OF A RETRODISPLACED UTERUS.

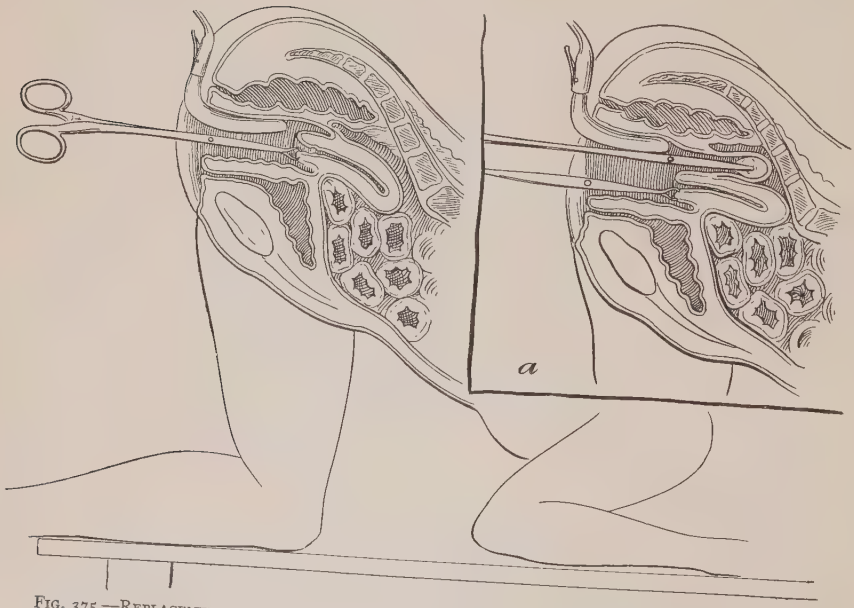


FIG. 375.—REPLACEMENT OF A POSTERIOR UTERINE DISPLACEMENT IN THE KNEE-CHEST POSITION.
Showing the cervix drawn forward and the fundus swinging clear of the promontory. Illustration *a* shows the fundus pushed anteriorly by direct pressure.

Replacement in the Knee-chest Position.—This is the best method to employ in the majority of cases, as the fundus of the uterus frequently gravitates unaided into an anterior position, when air rushes in and balloons out the vagina.

The technic is as follows: The bladder and rectum are emptied; the clothing loosened; and the patient placed in the knee-chest position.

Simon's speculum (curved blade) is introduced into the vagina and the perineum well retracted. If the uterus does not fall forward at once of its own weight, the anterior lip of the cervix is seized with bullet forceps and drawn forward in order to allow the fundus to swing clear of the sacral promontory.

Should the fundus still remain fixed, a ball of absorbent cotton held in the grasp of dressing forceps is pressed against the posterior wall of the uterus and the cervix drawn toward the vaginal outlet. This maneuver usually pushes the uterus clear of the sacrum and allows it to fall forward into position.

In cases in which there is difficulty in replacing the uterus in the knee-chest posture it may often be overcome by placing the patient in the knee-chest *elevated* position, which increases the force of gravity and aids materially in helping the fundus to swing past the sacral promontory.

FIG. 376.—SMITH-HODGE PESSARY.

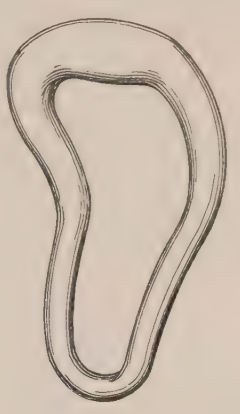


FIG. 377.—THOMAS PESSARY.

Keeping the Uterus in Position.—The uterus should be kept in position by a Smith-Hodge or a Thomas hard-rubber pessary.

The Pessary.—INTRODUCTION.—The patient is placed in the dorsal position and the labia separated with the thumb and index-finger of the left hand. The pessary is held by the anterior bar between the thumb and index-finger of the right hand and the posterior bar inserted in the transverse diameter of the vagina (Fig. 378).

It is then pushed downward and backward along the curve of the pelvis until the posterior bar lies transversely in the vagina and close against the anterior lip of the cervix (Fig. 379).

The index-finger of the left hand is now introduced into the vagina under the anterior bar of the pessary and its tip pressed against the posterior bar, directing it downward and backward behind the cervix (Figs. 380 and 381).

In some instances it may be advisable to introduce the pessary with the patient in the knee-chest position. This is easily accomplished by sight after the perineum is retracted by inserting the instrument into the vagina and placing the posterior bar behind the cervix (Fig. 382).

If the knee-chest posture is employed to replace the uterus, and the pessary then introduced with the patient in the dorsal position, care must be taken to prevent the womb from falling backward again when the change is made from the

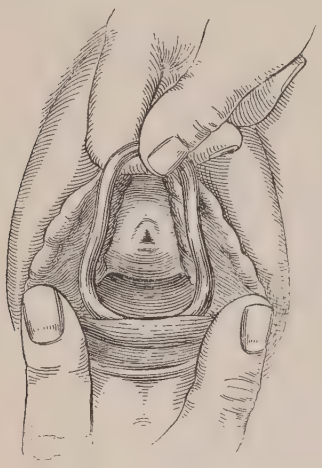


Fig. 378.

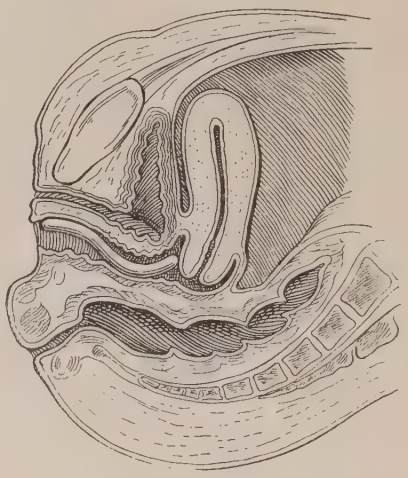


Fig. 379.

Introduction of a Pessary (page 349).

Fig. 378 shows the pessary being introduced into the vulvovaginal orifice; Fig. 379 shows the posterior bar of the pessary in contact with the anterior lip of the cervix.

first to the second position. After replacing the uterus the change in position must be made very slowly and the patient placed upon her side for a few moments before lying flat upon her back.

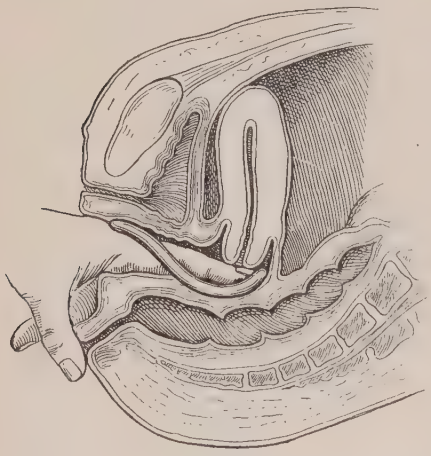


Fig. 380.

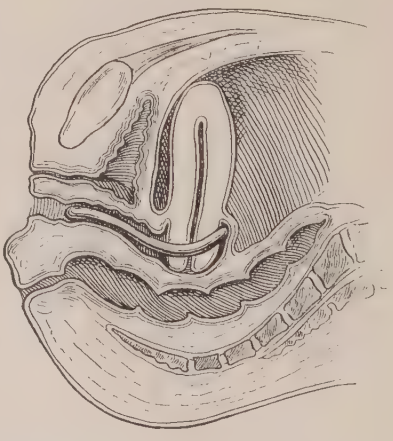


Fig. 381.

Introduction of a Pessary (page 349).

Fig. 380 shows the posterior bar of the pessary being pushed back of the cervix; Fig. 381 shows the pessary in position.

Adjustment.—A pessary must fit properly. It is, therefore, always advisable to have a number of sizes to select from and the means at hand to make

the necessary alterations in shape. The shape may easily be altered by coating that portion of the pessary to be changed with vaselin and holding it over the flame of an alcohol lamp until the rubber is softened. The required alterations are then made and the instrument plunged into cold water.

The patient should always be examined in the erect position after the pessary has been introduced, in order to determine whether or not it fits properly. A well-adjusted pessary should hold the uterus in place and cause no inconvenience or pain. In the erect posture the examiner's finger should pass between the pessary and the vagina at all points; the posterior culdesac should be taut; the cervix should be in front of the posterior bar and point in a backward direction; and the *up-and-down* movements of the uterus should be felt during respiration.

If the pessary holds the uterus above or below its normal level, the circulation is obstructed and the pelvic organs become congested. The height of the uterus can be regulated by changing the length and angle of the posterior curve of the

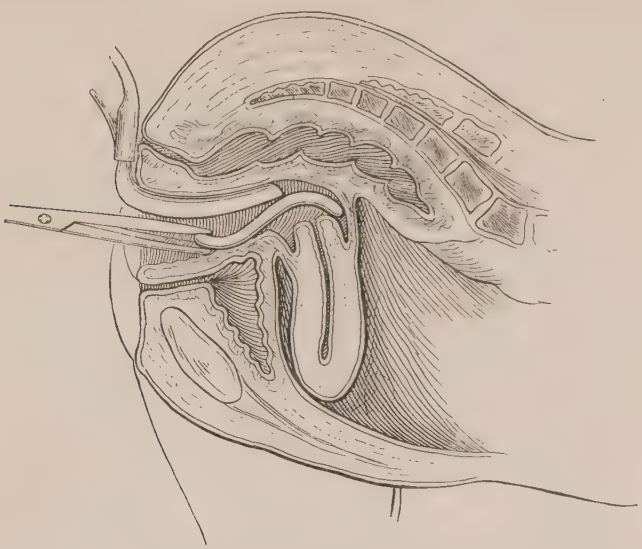


FIG. 382.—INTRODUCTION OF A PESSARY IN THE KNEE-CHEST POSITION (page 349).

pessary; a long, sharp curve holds the organ up higher than one which is short and less acute.

A pessary is supported in front by the pubic rami, and if the pressure falls too much upon the neck of the bladder or the urethra it is readily relieved by changing the anterior curve.

In the majority of posterior displacements a Smith-Hodge pessary fulfils all the indications, but in certain cases of sharp flexion a Thomas pessary will give better results on account of its broad posterior bar.

A properly adjusted pessary should not obstruct the vagina and interfere in any way with sexual intercourse.

CARE.—The patient should be under observation during the entire time she is wearing the pessary. She should be examined the day following its introduction; then once a week for a month; and finally every six weeks. The pessary should be removed every four months in order to ascertain its condition and to substitute a new instrument if the old one has become slightly eroded.

Vaginal injections of hot water should be used night and morning, and once a week the vagina should be douched with warm water and soapsuds. Salt solutions should never be introduced into the vagina while a pessary is being worn, as they cause incrustations to form on the rubber and eventually inflame the parts.

The patient should be instructed to have the pessary examined whenever it causes pain, or to remove it herself if necessary by hooking the index-finger over the anterior bar and making traction in the direction of the vulvar outlet. It sometimes happens, even after a pessary has been in place for a long time, that it suddenly becomes displaced during a bowel movement or during some unusual muscular effort. Again, the uterus may become misplaced and cause pain while the pessary itself remains in fairly good position. And, finally, if the patient becomes pregnant, she should be examined once a week and the pessary removed at the beginning of the fourth month.

Indications and Contraindications.—A pessary should only be used in primary posterior displacements, which are free from adhesions. It is contraindicated in secondary displacements and in cases associated with lacerations of the pelvic floor and the cervix.

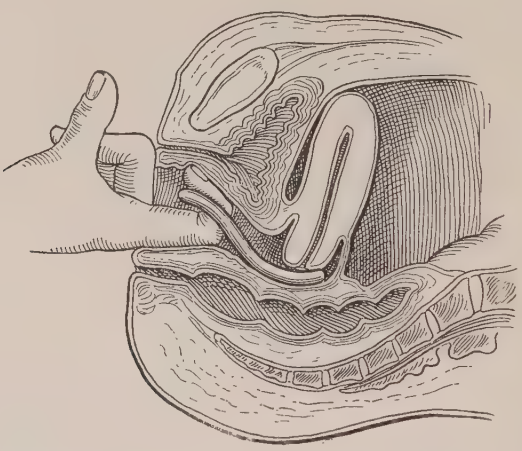


Fig. 383.—Shows Method by which a Patient Herself Removes the Pessary. Note that the index-finger is hooked over the anterior bar of the instrument.

Dangers.—If the pessary is too large, it may interfere with the bladder or rectum and cause an excoriation in the vagina. There is, however, but little likelihood of either of these conditions occurring if the simple fact is borne in mind that a properly fitting pessary causes no pain or inconvenience to the patient, and that an examination is indicated whenever the woman is conscious that she is wearing a support. On the other hand, neglect may cause deep excoriations, and death may result in some cases from the pressure of a pessary upon a gross pelvic lesion which was unrecognized by the surgeon.

Action.—A pessary holds the uterus in position by elevating the posterior culdesac of the vagina and drawing the cervix upward and backward. The fundus is thus thrown forward and the abdominal pressure is directed against the posterior face of the uterus. The pessary is kept in position by the supporting action of the pelvic floor and the retentive power of the abdominal cavity.

Reduction in the Size of the Uterus and Stimulation of its Ligaments.—The following routine methods of treatment

are recommended to cure the subinvoluted condition of the pelvic organs and stimulate the uterine ligaments: (1) Vaginal douches of hot water; (2) ichthyol tampons; and (3) pelvic massage.

The physiologic action and technic of the vaginal douches are described on page 91.

An ichthyol tampon should be introduced into the vagina three times a week and removed on the following morning. It should be made of cotton-wool and saturated with a solution of ichthyol and glycerin (25 per cent.).

Pelvic massage is indicated and should be employed provided a properly qualified nurse is available.

General Treatment and Hygiene.—Careful attention should be given to the general condition and environment of the patient.

The bowels should be kept regular with a mild laxative and the occasional use of a saline; gastric disturbances should be corrected; and the patient placed upon a tonic course of treatment. The patient's clothing should be arranged so as not to constrict or drag upon the abdominal viscera and crowd the uterus backward, and the abdomen should be supported by a bandage to increase its retentive power. The bathing should be regulated and at least eight hours devoted to sleep. The indoor exercises described on page 117 are especially indicated and should be employed on account of their stimulating action upon the retentive power of the abdomen.

Chronic Cases.—The treatment of chronic posterior displacements of the uterus is operative. The causes and results of the lesion must be removed before a radical operation is performed (see Recent Cases), and consequently if the cervix is torn it must be restored to its normal condition; tears in the perineum or the pelvic floor must be repaired; and the uterus cureted if endometritis is present. By repairing the lacerations and cureting the uterus immediately before the abdomen is opened to correct the displacement the entire series of operations can be performed at one time and the necessity of placing the patient again under an anesthetic obviated.

The use of a pessary may in some cases effect a symptomatic cure, but the displacement will recur as soon as the instrument is discarded, and it should therefore only be employed when the patient refuses operative measures. Adhesions and pelvic tenderness are absolute contraindications to the use of a pessary.

The operations, in my judgment, which should be employed for the radical cure of posterior displacements of the uterus are:

Ventral suspension of the uterus.

Intraperitoneal shortening of the round ligaments.

Ventral Suspension of the Uterus (Kelly's operation).—*Technic of the Operation.*—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 834 and 837.

Position of the Patient.—Trendelenburg posture.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Instruments.—(1) Scalpel; (2) blunt-pointed scissors; (3) three short hemostatic forceps; (4) dressing forceps; (5) two small, delicate, full-curved needles; (6) three long, straight, triangular-pointed needles; (7) No. 2 braided silk; (8) plain cumol catgut No. 2, three envelopes; (9) silkworm-gut—20 strands (Fig. 384).

In cases complicated by other pelvic lesions the full list of instruments used in

the operation of salpingo-oöphorectomy should be sterilized and ready for any emergency which may arise. (See p. 973.)

Operation.—First Step.—An incision is made through the abdominal wall in the median line just above the symphysis pubis and extending upward for a distance of two inches.

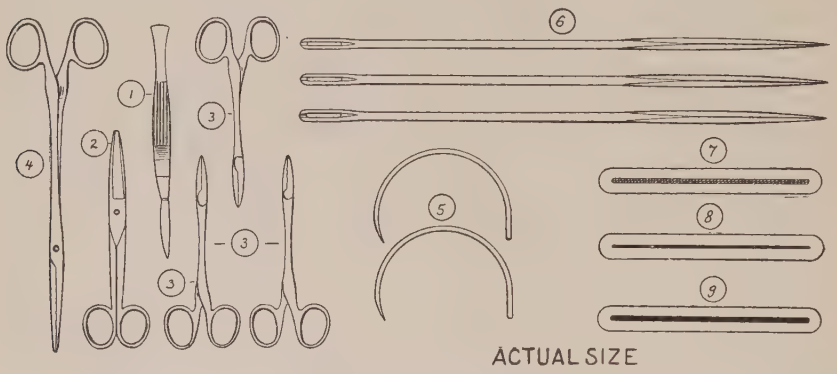


Fig. 384.—Instruments, Needles, and Suture Materials Used in the Operation of Ventral Suspension of the Uterus (page 353).

One of the hemostatic forceps is used as a needle-holder.

Second Step.—The index and middle fingers of the left hand are passed into the peritoneal cavity and gently inserted between the uterus and the rectum. The adhesions are then carefully separated and the fundus of the uterus lifted forward into its normal position.

Third Step.—The peritoneum at the lower angle of the wound is seized with hemostatic forceps and drawn into the incision and the first suspension suture

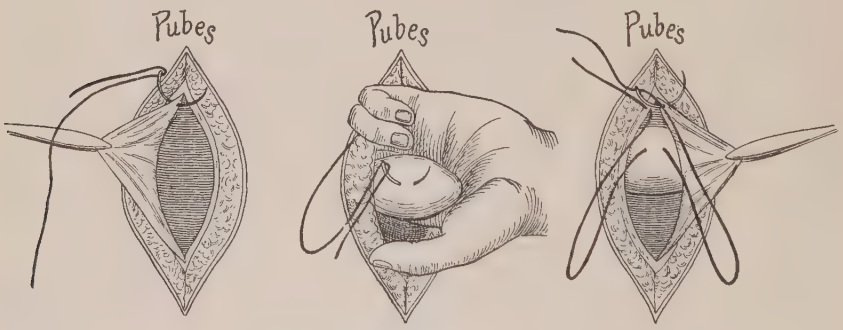


Fig. 385. Fig. 386. Fig. 387.

Ventral Suspension of the Uterus—**Third Step.**

Fig. 385 shows the first suspension suture being introduced through the peritoneum; Fig. 386 shows the same suture being passed into the fundus of the uterus; Fig. 387 shows the same suture being passed through the peritoneum on the opposite side.

introduced close to its divided edge on the left side. The index and middle fingers of the left hand are then passed into the abdominal cavity and the uterus securely held while the suture is passed through the fundus.

The suture is now introduced into the fundus directly on a line dividing the uterus transversely into two equal halves and buried one-quarter of an inch deep in the uterine tissue with a distance of about half an inch between the points of

entrance and exit. The uterus is then released by the fingers of the left hand and the suture passed through the peritoneum opposite to its point of entrance.

The second suture is now passed through the peritoneum on the left side one-quarter of an inch above the first suture. It is then passed through the fundus

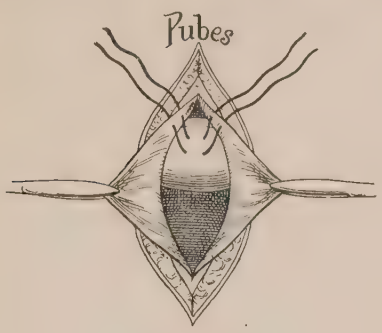


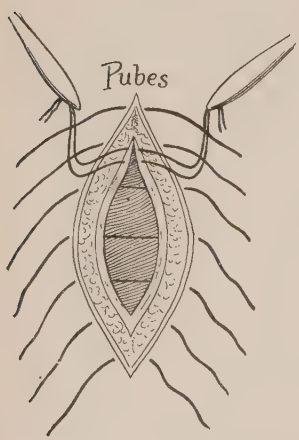
FIG. 388. FIG. 389.

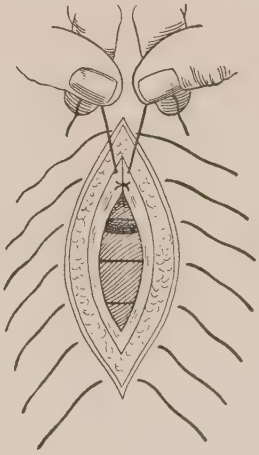
VENTRAL SUSPENSION OF THE UTERUS—Third Step.

Fig. 388 shows both suspension sutures in position; Fig. 389 shows fundus of uterus and the points of entrance and exit of both suspension sutures (1, 1, and 2, 2).

about one-quarter of an inch behind the first suture, and finally through the peritoneum opposite to its point of entrance.

It is not necessary to hold the fundus between the fingers while the second suture is introduced, as the uterus can be easily controlled by making traction upon the free ends of the first suture. After both sutures have been introduced





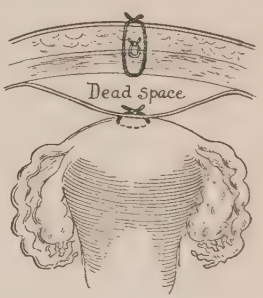


FIG. 390. FIG. 391. FIG. 392.

VENTRAL SUSPENSION OF THE UTERUS—Fourth Step.

Fig. 390, sutures closing the abdominal wall in position; Fig. 391, tying the suspension sutures; Fig. 392, dead space resulting from a faulty technic in introducing the sutures at the lower angle of the abdominal wound.

their free ends are seized with forceps and placed on each side of the abdominal incision.

FOURTH STEP.—The through-and-through sutures closing the abdominal incision are introduced and the suspension sutures tied.

The first three sutures closing the incision at the lower angle of the wound must be introduced so as to pass completely under the peritoneum at its points of attachment with the fundus, otherwise the weight of the uterus will cause stripping and a large dead space will result which will eventually become filled with serum or blood and suppurate (Fig. 392).

After all of the incision sutures are introduced the suspension sutures are drawn taut so as to take out the slack and bring the fundus of the uterus up against the peritoneum. The sutures are then tied and their free ends cut off close to the knots (Fig. 391).

FIFTH STEP.—The abdomen is closed and the wound dressed in the usual manner (see p. 905).

The fascia is first united with a continuous suture of catgut and the wound then closed by tying the through-and-through sutures. The sutures in the lower angle of the wound are tied first, and especial care must be taken to remove the slack and bring the peritoneum, at its points of attachment with the fundus, snugly against the abdominal wall.

General Remarks.—The operation of ventral suspension of the uterus was devised by Kelly and its results are most satisfactory. The procedure is practically without danger to life, and when properly performed no bad effects are observed during subsequent pregnancies or labors.

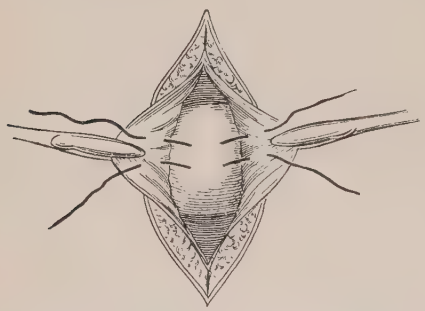


FIG. 393.—VENTRAL SUSPENSION OF THE UTERUS. Shows Kelly's method of introducing the suspension sutures.

The technic of the operation as described above is practically the same as given by Kelly, with the exception that the suspension sutures are introduced through the peritoneum in a different manner, and special attention is also called to the necessity of guarding against leaving a dead space between the peritoneum and the abdominal wall. If suppuration occurs at the point of attachment between the peritoneum and the abdominal wall, a firmly fixed union occurs and the object of the operation is defeated.

Figure 394 shows the correct and incorrect methods of introducing the sutures into the fundus of the uterus. The small needle in the illustration gives the correct method, which aims to secure a narrow and delicate attachment between the fundus and the peritoneum. As the result of this technic there is developed in the course of a few weeks a small band or ligament, about two to two and a half inches long, half an inch wide, and one-eighth of an inch thick, between the uterus and the abdominal wall. The ligament holds the uterus in an anterior position and acts as a tether rope by preventing the fundus from tilting backward. The uterus is not held closely against the abdominal wall in a fixed or immovable position, but has a wide range of movement, and there is no interference with its development during pregnancy or with the normal presentation of the fetus during labor.

The bad results which have been reported from time to time following the operation of ventral suspension of the uterus are due to the fact that the majority of operators use an incorrect technic and introduce the sutures with a large, curved needle, entering the fundus near the oviduct and coming out on the opposite side in the same position. The sutures also include the aponeurotic fascia,

the muscles, and the peritoneum, and are secured by tying their free ends over the aponeurosis before the abdominal incision is closed. Naturally, this technic must result in a firm and lasting union between the uterus and the belly wall, and consequently evil results are almost certain to follow during pregnancy or labor.

As the result of a large experience in the operation of ventral suspension of the

FIG. 394. FIG. 395.

VENTRAL SUSPENSION OF THE UTERUS.

Fig. 394 shows the correct and incorrect methods of introducing the sutures; Fig. 395 shows the suspensory ligament resulting from the operation.

uterus I have no hesitation in saying that it is the best treatment for the radical cure of chronic posterior displacements, and, furthermore, I believe that when this operation is properly appreciated by the profession many of the cases of *so-called nervous prostration* will be permanently relieved and a large number of women restored to health.

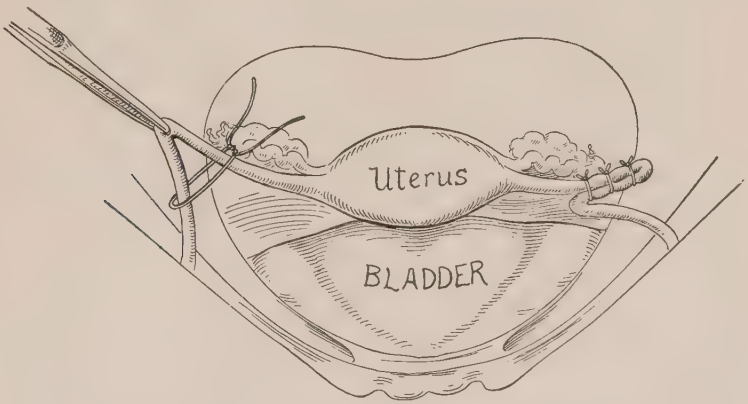


FIG. 396.—VENTRAL SUSPENSION OF THE UTERUS—**Variation in Technic.**
Showing Wylie's method of shortening the round ligaments.

Variation in the Technic.—In some of my operations of ventral suspension I shorten the round ligaments by Wylie's method before tying the suspension sutures, in order to strengthen the position of the uterus and guard against a recurrence of the displacement.

The procedure is very simple and consists in seizing the middle of the ligament with forceps and pulling it into the abdominal incision. A silk ligature is then thrown around the ligament and tied so as to make it taut, and the loop which remains is finally obliterated by one or two additional ligatures (Fig. 396).

Intra-peritoneal Shortening of the Round Ligaments (Mann's Operation).—*Technic of the Operation.*—The Preparation of the Patient; the Preparations for the Operation; the

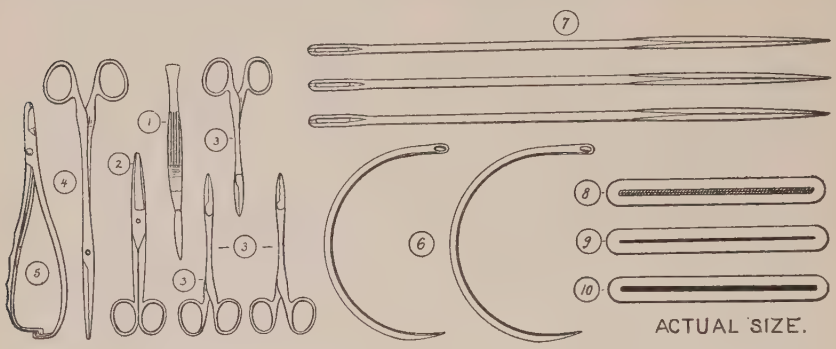


Fig. 397.—Instruments, Needles, and Suture Materials Used in Shortening the Round Ligaments.

Position of the Patient; and the Number of Assistants are the same as in the operation of Ventral Suspension of the Uterus.

Instruments.—(1) Scalpel; (2) blunt-pointed scissors; (3) three short hemostatic forceps; (4) dressing forceps; (5) Hagedorn needle-holder; (6) two small full-curved Hagedorn needles; (7) three long, straight, triangular-pointed needles; (8) No. 7 braided silk; (9) plain cumol catgut, No. 2—three envelopes; (10) silkworm-gut—20 strands.

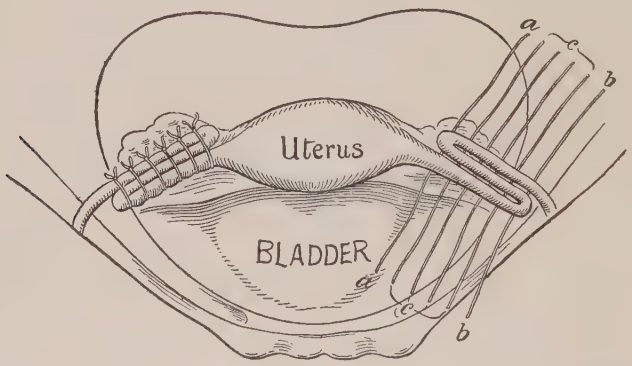


Fig. 398.—Shortening the Round Ligaments—Second Step (Mann's Operation).

In cases complicated by other pelvic lesions the full list of instruments used in the operation of salpingo-oöphorectomy (see p. 973) should be sterilized and ready for any emergency which may arise.

Operation.—First Step.—The index and middle fingers of the left hand are passed into the abdominal cavity and the uterus brought forward, after separating any adhesions which may be present.

Second Step.—The round ligament on each side of the uterus is folded upon itself twice so as to form three equal parts, which are held together and permanently united by silk ligatures.

The ligatures are introduced as follows: The first ligature (*a*) is passed close to the uterus and through the folds of the ligament; the second (*b*) is passed through the parietal end of the ligament; and the intervening space is united by additional ligatures (*c, c, c, c*) (Fig. 398).

The operation is facilitated by tying each suture as it is inserted.

Indications for the Operation.—The indications are the same as in the operation of ventral suspension of the uterus. In secondary displacements associated with thickening of the base of the broad ligaments the operation gives especially good results and should be performed instead of ventral suspension.

INVERSION.

Definition.—An inversion of the uterus is where the organ is more or less completely turned inside out. The displacement may be *partial* or *complete;* in the former the fundus is depressed, and in the latter the uterus is pushed through the cervical opening. An inversion may also be described as *acute* or *chronic*, according to the length of time it has existed.

Causes.—The condition is very rare. It occurs most frequently during childbirth, but it has also been observed in the non-gravid uterus and in virgins.

Before it is possible for an inversion to occur there must be a relaxation of a portion of the uterine wall which is surrounded by normal muscular activity. This point of relaxation in childbirth is the site of the placenta, and in the non-gravid uterus it is generally the situation of a new-growth. Any form of traction

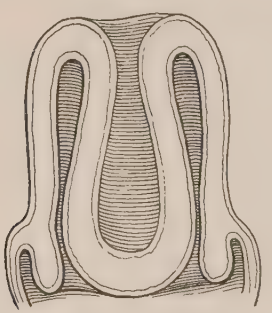


Fig. 399.—Partial.

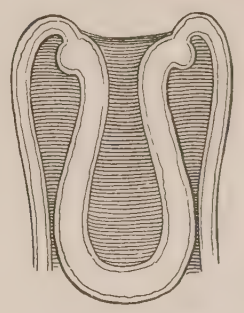


Fig. 400.—Complete.

Inversion of the Uterus.

from below or pressure from above will therefore start an inversion by depressing the relaxed portion of the uterus, which is at once acted upon by the surrounding muscles, whose contractions gradually increase the displacement until it becomes more or less complete. In other words, the depressed portion acts as a foreign body in the uterine cavity and the uterus in attempting to expel it naturally turns itself inside out. Sometimes the entire uterine wall may be relaxed and an inversion may occur from continued traction or pressure.

The Puerperal Causes are:

A short cord.
Early traction upon the cord.
Fundal attachment of the placenta.

Adherent placenta
Delivery in the erect posture.
A rapid labor.
Injudicious pressure or palpation over the fundus of the uterus.
Violent intra-abdominal pressure.

The Non-puerperal Causes are:

Interstitial uterine tumors.
Uterine polypi.
Unknown conditions causing spontaneous inversion.

Pathologic Anatomy.—The condition of the uterus and its appendages depends upon the degree of inversion and the duration of the affection. In some cases there is only a cup-shaped depression present; in others the indentation of the uterine wall is so deep that the inverted portion reaches as far as the external os; and, finally, the fundus may be pushed through the cervical rim into the vagina or the organ may hang between the thighs if the case is complicated with descent of all the pelvic structures.

A complete inversion of the uterus is very rare; in fact, the possibility of the condition occurring is denied by some observers. In acute cases the internal funnel formed by the inverted fundus contains the uterine appendages, the round ligaments, and, in some instances, also a knuckle of gut or a portion of the omentum. In chronic cases, however, this funnel becomes more or less obliterated by contraction or by adhesions occurring between the peritoneal surfaces, and consequently it usually contains only the oviducts and round ligaments. In *acute cases* the inverted uterus forms a large pear-shaped tumor occupying the vagina or hanging between the thighs and constricted at its upper or narrowest portion by the cervix. The mass is soft and vascular and the opening of the oviducts may be seen if a careful search is made. If the placenta is not attached, its site is easily recognized. In *chronic inversion*, on the other hand, the appearance and characteristics of the tumor are entirely different. The mass is not so soft; it has lost much of its vascularity; and resembles somewhat a pear-shaped polypus. The endometrium is also altered; it has fewer glands than normal; and looks like the surrounding vaginal mucous membrane. If the surface of the tumor becomes irritated, ulcerations may occur; and, again, in some cases the mass may become gangrenous from constriction. Ulcerative changes are more apt to occur when the case is complicated with prolapse of the vagina and the inverted uterus hangs outside between the thighs. In this position the surface of the inverted womb becomes more or less hardened and cutaneous in character.

Symptoms.—The character of the symptoms depends upon the rapidity with which the displacement occurs. A *puerperal inversion* occurs suddenly and is an acute condition, but in a *non-gravid uterus* the displacement develops slowly and pursues a more or less chronic course.

The symptoms of **acute inversion** are:

Severe pelvic pain.
Profuse hemorrhage.
Shock.

The hemorrhage may not be severe if the placenta is still attached to the uterus, and in very exceptional instances dangerous symptoms may be absent altogether; this is probably the rule in cases of partial inversion.

The symptoms of **chronic inversion** are:

Hemorrhage.
Leukorrhea.
Lumbosacral pain.
Sensation of bearing-down, dragging, or weight in the pelvis.

Pressure upon the rectum and bladder.
Anemia.
Neurasthenia.

As a rule, the hemorrhage is continuous, and the daily loss of a small quantity of blood eventually produces marked anemia and general debility. In other cases the bleeding is intermittent or violent hemorrhages may occur at the time of the menstrual periods. Leukorrhea is a very constant symptom. The discharge often becomes purulent and very offensive, having all the characteristics of malignancy.

Diagnosis.—Acute Inversion.—The diagnosis, as a rule, is easily made from the history of the case and the physical examination. After the delivery of the child the patient suddenly complains of severe pelvic pain, which is quickly followed by profuse hemorrhage and shock. A vaginal examination reveals the presence in the vagina of a soft, pear-shaped tumor, which is constricted above at its narrowest portion by a rim or collar—the cervix uteri, beyond which the finger or a sound cannot be made to pass (Fig. 401). The surface of the mass is vascular and the openings of the oviducts may be seen. The placenta may or may not

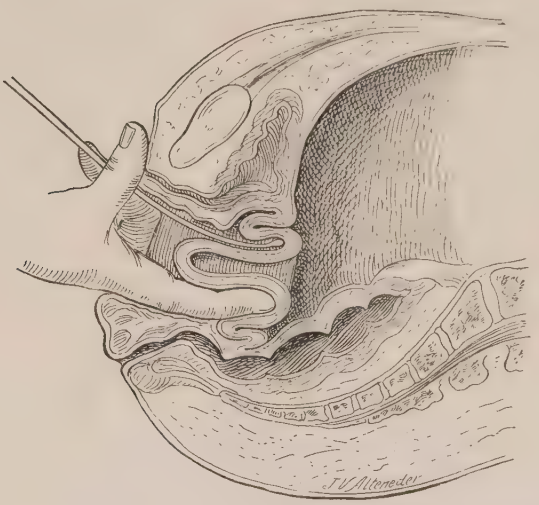


Fig. 401.—Diagnosis of Inversion of the Uterus with the Finger or the uterine Sound in the Cervical Collar.

be attached; in the latter case its site is easily recognized. Rectal touch combined with pressure from above through the abdominal wall (*recto-abdominal palpation*) demonstrates the absence of the body and fundus of the uterus and the presence of a funnel- or cup-shaped depression at or above the position of the cervix (Figs. 402 and 403). In fat women the absence of the uterus may be determined by rectal touch combined with a sound in the bladder.

Chronic Inversion.—There is nothing characteristic in the symptoms or history of the case, and the diagnosis consequently depends entirely upon the physical examination. Vaginal touch reveals the presence of a pear-shaped tumor resembling a uterine polyp. The surface of the mass looks like the surrounding mucous membrane, and it may be the seat in some cases of spots of ulceration or even gangrene. If the displacement is complicated with prolapse of the vagina, the endometrium becomes hardened and cutaneous in character.

A cervical collar surrounds the upper or narrowest portion of the mass and a sound or the finger cannot be passed up for any distance between it and the inverted part of the uterus. The absence of the fundus of the uterus and the presence of a funnel- or cup-shaped depression are determined by the same methods as those used in cases of *acute inversion.*

Differential Diagnosis.—A chronic inversion of the uterus may be mistaken for a uterine polypus.

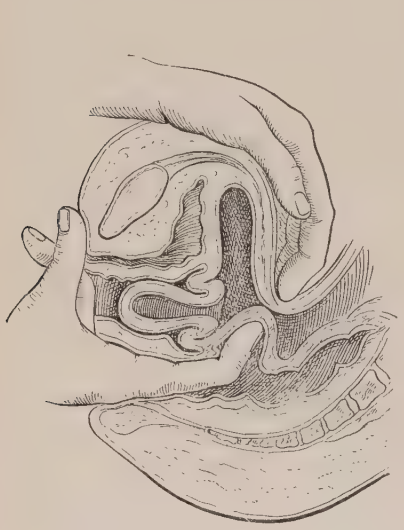


FIG. 402.

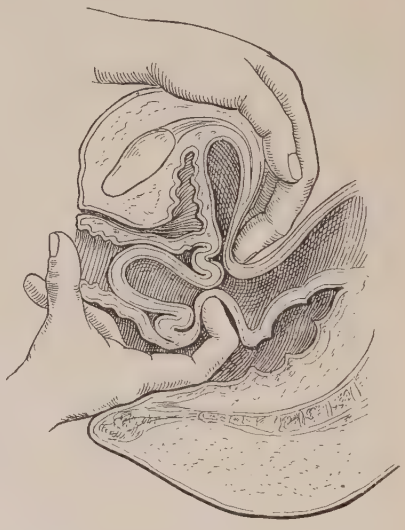


FIG. 403.

DIAGNOSIS OF INVERSION OF THE UTERUS (page 361).

Fig. 402 shows the absence of the body of the uterus from the pelvic cavity; Fig. 403 shows the presence of a cup-shaped depression above the cervix.

INVERTED UTERUS.	UTERINE POLYPUS.
1. Always pyriform and symmetric in shape.	1. Often irregular in shape.
2. Deep red in color and of a soft consistency.	2. Lighter in color and not so soft.
3. Bleeds easily.	3. Does not bleed easily.
4. Orifices of oviducts are usually seen.	4. Absent.
5. Absence of body and fundus above cervix.	5. Body and fundus of uterus in normal position.
6. Cup-shaped depression above cervix.	6. Absent.
7. Presence of cervical collar or rim.	7. Same.
8. Absence of cervical and uterine canals.	8. Uterine and cervical canals not obliterated.
9. Uterine sound will not pass into cavity of uterus.	9. Sound will pass into uterine cavity except where it is obstructed by the attachment of the polypus.

The existence of a *partial inversion* of the uterus is often overlooked when it is associated with a uterine tumor or polyp. The diagnosis depends upon the length of the uterine canal and the presence of a cup-shaped depression at the point of inversion. A neoplasm always increases the size of the uterine cavity; therefore, if the canal measures less than normal, two and a half inches, it is fair to presume that the decrease is due to a partial inversion, and if the examination reveals a cup-shaped depression at the fundus, the diagnosis is established.

Prognosis.—Acute Inversion.—The prognosis is very grave, and death may occur from hemorrhage, shock, or sepsis. If the displacement is reduced

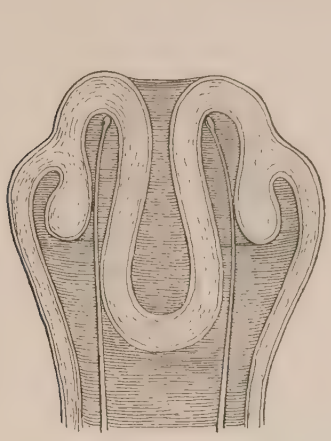


Fig. 404.

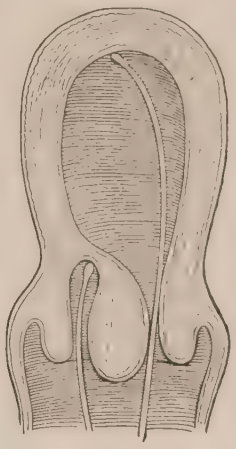


Fig. 405.

Differential Diagnosis between Inversion of the Uterus and a Uterine Polypus.

Fig. 404 shows the passage of a sound obstructed by the inverted uterus; Fig. 405 shows a sound in the uterine cavity and also one obstructed at the point of attachment of the polypus.

at once, the prognosis is more favorable than when several hours or days are allowed to elapse before making an attempt to replace the organ. Spontaneous

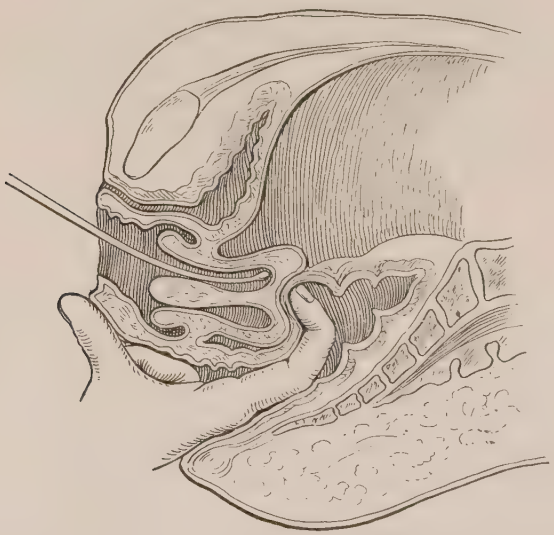


Fig. 406.—Differential Diagnosis of a Partial Inversion Associated with a Uterine Tumor. Shows the cup-shaped depression at the point of inversion and the shortening of the uterine cavity being demonstrated by a uterine sound.

reduction is very rare. The tendency of a partial inversion is to gradually increase until it becomes more or less complete. Pregnancy may take place after

the reduction of an inverted uterus provided the oviducts have not been injured by septic infection.

Chronic Inversion.—A patient suffering with chronic inversion of the uterus eventually dies, as a rule, from exhaustion due to hemorrhage and pain, or she may fall a victim to some trifling intercurrent disease. Spontaneous reduction is a rare phenomenon, and amputation of the inverted body and fundus has been known to occur as the result of gangrene.

A partial inversion of the uterus associated with a uterine tumor is usually permanently cured by the removal of the neoplasm.

Treatment.—Acute Inversion.—An attempt should be made to reduce the inversion immediately after the accident, as delay increases the chances of failure and death.

The patient should be anesthetized, placed in the dorsal posture, and the reduction of the displaced fundus made by the hands, as instrumental taxis is not indicated in acute cases.

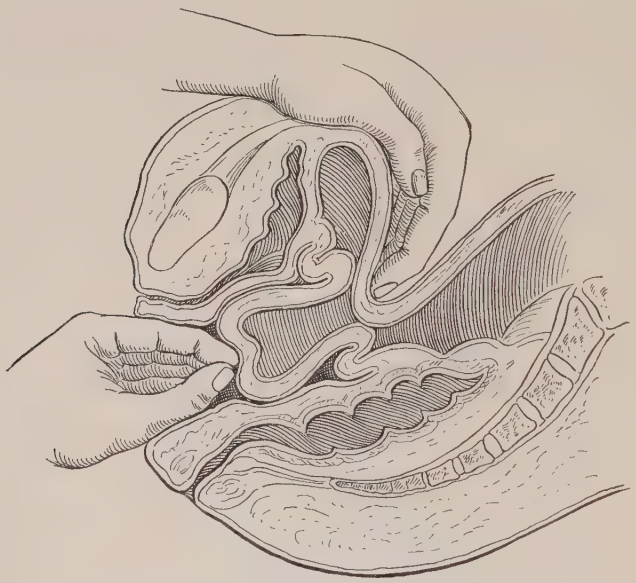


Fig. 407.—Replacement of an Acute Inversion of the Uterus by the Fingers Formed into a Cone.

The technic of the procedure is as follows: If the placenta is attached, it should be removed immediately. The fingers of the left hand are then formed into a cone, introduced into the vagina, and pressed against the inverted fundus, while the fingers of the other hand make counter-pressure from above through the abdominal wall upon the cervical rim or collar.

As the result of these manipulations the fundus slowly passes back through the cervical rim and the uterus is eventually replaced.

After the reduction is fully accomplished the hand should remain in the uterine cavity while a douche of at least two gallons of hot salt solution is thrown into the uterus to relieve the relaxation and stimulate the muscular contractions. The case is now treated upon general and obstetric principles as one of simple uterine inertia.

In some cases it will be found impossible to reduce the uterus by the method

just described and a more gradual form of reduction must be employed. The best procedure under these circumstances is to push up only a small portion of the inverted uterus at a time with the finger near the cervical rim, continuing the manipulation until the entire mass is replaced.

The patient should be placed under the influence of chloroform during the reduction of the displacement and all manipulative efforts should cease when the intermittent contractions of the uterus occur.

Chronic Inversion.—The treatment is divided into:

Preparatory treatment.
Replacement of the uterus.
Vaginal hysterectomy.

Preparatory Treatment.—Before attempting the replacement the patient should be placed upon a preparatory course of treatment for a period of two weeks to lessen the congestion of the pelvic organs and the size of the uterus. The treatment should consist of rest in bed; a vaginal douche of two gallons of

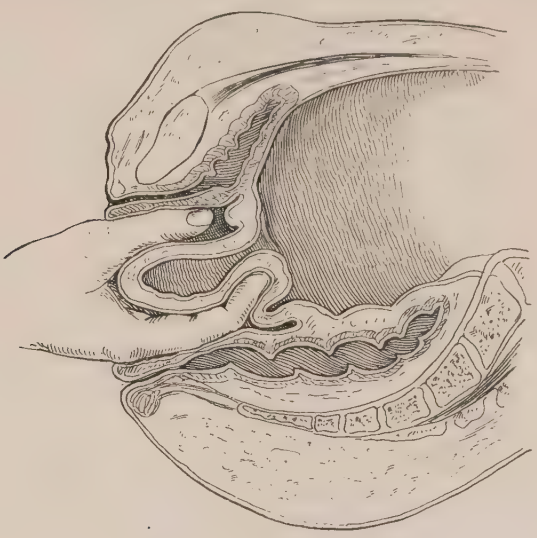


Fig. 408.—Replacement of an Acute Inversion of the Uterus by Pushing up a Small Portion of the Inverted Organ at a Time.

hot normal salt solution, morning, noon, and night; the regulation of the bowels by the use of a mild laxative or an enema and the occasional administration of a saline; and a simple and easily digested diet.

Replacement of the Uterus.—After the preparatory treatment has been carried out in the manner just described an attempt should be made to replace the uterus. The gradual method of replacement is in my judgment not only the most successful, but at the same time the safest plan to adopt, as the structural changes in the uterine walls and the adhesions and contractions which are likely to exist in cases of chronic inversion render an attempt at forcible reduction extremely dangerous to the life of the patient. I shall therefore only describe and recommend gradual replacement of the uterus in chronic cases, and at the same time condemn all manual or instrumental means and cutting operations, because I believe that if reduction cannot be accomplished by the slower and safer plan the case is hopeless and the organ should be removed by vaginal hysterectomy.

Gradual Replacement.—The length of time required to effect the replacement varies with each case on account of the structural and other conditions which may be present in or around the uterus. The method, however, should be continued for at least five or six weeks, although, as a rule, the reposition of the organ takes place sooner. During the entire period the patient must be kept in bed; the bowels regulated as recommended in the preparatory treatment; and the catheter employed if urination is interfered with by the necessary distention of the vagina.

Gradual reduction may be accomplished by *tamponading the vagina* or by the use of *Braun's colpeurynter*. The latter method of replacement acts by direct pressure upon the uterus, and consequently it not only lessens the size of the inverted portion of the organ and removes the adhesions about the cervix, but it also constantly tends to push the fundus up through the cervical rim or collar.

The Method of Tamponading the Vagina is as Follows: The patient is placed crosswise on the bed and arranged in the dorsal position. The vagina is then irrigated with a solution of corrosive sublimate (1 to 2000), followed by

Fig. 409.—Replacement of a Chronic Inversion of the Uterus by Tamponading the Vagina.

normal salt solution, and thoroughly dried. Simon's speculum is now introduced and the vagina packed with strips of iodoform gauze three inches wide. The tampon must be carefully and firmly packed in the culdesacs and also around and below the inverted uterus until the vagina is completely filled with gauze. The packing is held in position with a compress and T-bandage which is temporarily removed when the bladder and bowels are emptied. The vagina should be thoroughly irrigated and a fresh tampon applied every second day.

The Method of Employing the Colpeurynter is as Follows: The position of the patient and the preparation of the vagina are the same as when the tampon is used. The rubber bag is smeared with zinc ointment to prevent abrasions and then introduced into the vagina. Warm air or water is now injected into the instrument until the patient complains of the distention. The colpeurynter should be removed for several hours each day and reintroduced

with the same precautions. The amount of air or water injected into the bag is gradually increased as the patient becomes accustomed to the pressure. Sometimes the bag obstructs the urethral canal and it may be necessary to temporarily let out some of the air or water when the patient desires to urinate.

A colpeurynter is more effective in its results and easier to adjust in the vagina than a tampon, and consequently it should always be preferred. Moreover, it requires considerable skill and experience to properly pack the vagina in

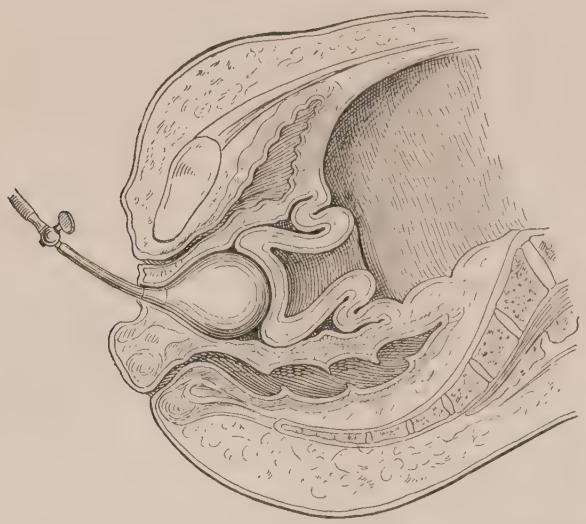


FIG. 410.—REPLACEMENT OF A CHRONIC INVERSION OF THE UTERUS WITH BRAUN'S COLPEURYNTER.

cases of uterine inversion, and many instances of unsuccessful attempts at reduction by this means are directly due to an improper method of introducing the gauze.

Vaginal Hysterectomy.—The complete removal of the uterus by the vaginal route is indicated when gradual reduction fails to restore the organ to its normal position. The technic of the operation is described on page 999.

Amputation of the inverted portion of the uterus should be condemned as an unsurgical and dangerous operation.

UTERINE DISPLACEMENTS OF SECONDARY IMPORTANCE.

As these displacements are secondary to or caused by certain gross pelvic lesions, it naturally follows that the *symptoms*, *diagnosis*, *prognosis*, and *treatment* of these cases are based upon the pathologic conditions present and not upon the malposition of the uterus itself. These lesions are considered in their respective chapters and need not, therefore, be discussed here. It should, however, always be remembered that after the lesion has been removed by surgical interference the displacement often remains because the ligaments of the uterus have been overstretched and permanently weakened by the abnormal position of the organ. Under these circumstances, therefore, the uterus should be restored to its normal position by either the operation of ventral suspension or intraperitoneal shortening of the round ligaments.

FIBROMATA.

Causes.—Nothing is known of the cause of these tumors. They develop, as a rule, during the menstrual period of a woman's life. The largest number of cases is observed between thirty and forty-five years of age, but cases have been reported in young girls before puberty and in women after the menopause. These tumors are not only the most frequent neoplasm of the uterus, but they are also of very common occurrence. They are more frequently observed in single and sterile women than in those who have borne children, and the colored race in this country is found to be more susceptible to the disease than the white.

Description.—Fibroid tumors are found in all parts of the uterus, but they occur, however, most frequently above the internal os. They are developed from the muscular or middle coat of the organ and are composed of the same tissues—unstriped muscular fibers and fibrous connective tissue. They are classified histologically into *fibroma*, *myoma*, *fibromyoma*, and *myofibroma*. The muscular tumor, or myoma, is less common than the other varieties. Fibroids

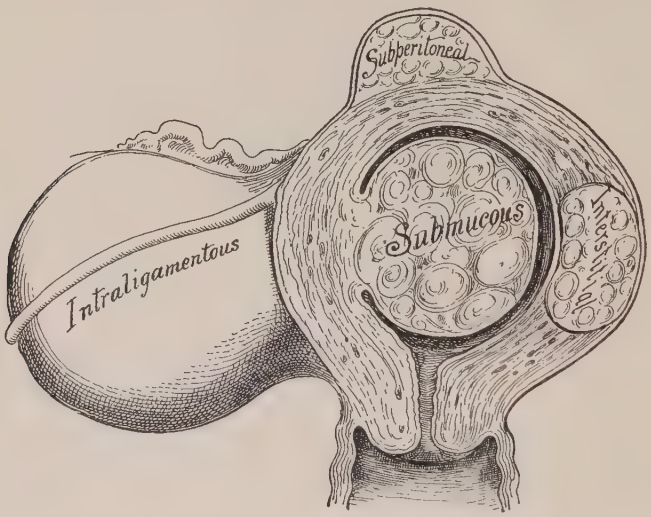


FIG. 411.—VARIETIES OF FIBROID TUMORS OF THE UTERUS.

may be single, but in the majority of cases they are multiple, and exist in groups or are found scattered over different portions of the uterus. They range in size from a small pea to a tumor weighing one hundred and eighty pounds or more, and differ in consistency from a hard fibroma to a myoma which is sometimes so soft that a sensation of fluctuation is imparted to the examining fingers. These tumors are white or pinkish in color and they show upon section concentric layers of fibrous connective tissue arranged around various central points which project somewhat beyond the cut surface. Usually the tumor is surrounded by a capsule of loose connective tissue, from which it is readily shelled out or enucleated unless adhesions have occurred as the result of inflammation. Fibroids are benign tumors, but they may, however, be associated with malignant disease. They grow slowly, as a rule, and are often many years in attaining to the size of a child's head. In the case of multiple tumors they do not all grow with equal rapidity, and it is the rule to find growths of various sizes in the same uterus.

Sometimes a fibroid will cease to grow altogether and remain quiescent for an indefinite period, or it may develop so slowly that the patient is hardly aware of any increase in its size. When a fibroid tumor suddenly begins to grow rapidly, it is usually due to pregnancy or cystic degeneration.

Varieties.—Fibroid tumors, as has already been said, develop from the muscular or middle coat of the uterus, and from this situation they grow either toward the peritoneum, into the uterine cavity, or between the layers of the pelvic tissues. They are, therefore, known as *interstitial* or *intramural* fibroids when they are situated wholly within the muscular wall; as *subperitoneal* or *subserous* fibroids when they bulge outwardly beneath the peritoneum; as *submucous* fibroids when they push inwardly into the uterine cavity; and as *intraligamentous* fibroids when they project from the sides of the uterus or from any part of the supravaginal cervix between the layers of the pelvic tissues.

Interstitial Fibroids.—These tumors are generally associated with fibroid hypertrophy of the muscular coat. The uterus is symmetrically increased in size and its surface is smooth. The general enlargement of the uterus is sometimes so

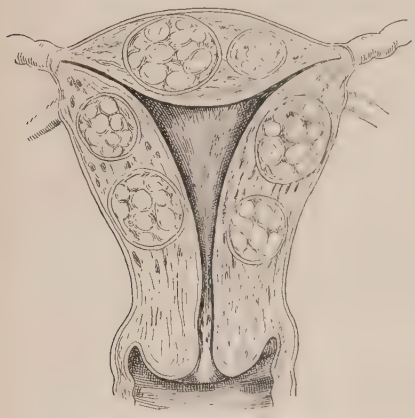


FIG. 412.—INTERSTITIAL FIBROID TUMORS OF THE UTERUS.

FIG. 413.—SESSILE AND PEDUNCULATED SUBPERITONEAL FIBROID TUMORS OF THE UTERUS.

great that it forms a tumor occupying the entire abdominal cavity. Upon section a number of tumors are observed of varying size scattered throughout the uterine walls. They are usually hard, circumscribed, and enclosed in capsules, from which they are readily shelled out unless adhesions have formed as the result of inflammation. In other cases, however, the tumors are more or less soft and without investing sheaths.

Subperitoneal Fibroids.—These tumors, as a rule, are multiple, although occasionally a single nodule is seen upon the surface of the uterus. The nodules are scattered over the uterus and vary in size from a small pea to a mass weighing forty pounds or more. These tumors always begin as sessile growths, but as they develop and push the peritoneum forward their attachment or connection with the uterus becomes more and more constricted, until eventually distinct pedicles are formed which vary in length and thickness. Sometimes the pedicle becomes twisted and the fibroid is completely separated from the uterus, when it either forms adhesions with and derives a new blood-supply from one of the neighboring organs, or it remains unattached in the abdominal cavity and is known as a

migrating tumor. If a large tumor is attached to the fundus, it is likely to pull the uterus upward as it grows and cause the lower uterine segment to become so greatly stretched as to give it the appearance of a narrow or constricted pedicle. The range of movement in a pedunculated tumor depends upon the length of its pedicle and the situation of the adhesions, when they are present. If the growth is attached to the intestines or omentum, its mobility is not restricted; but if it has become adherent to some fixed point in the pelvis or abdomen, it must necessarily remain permanently in that position. Subperitoneal tumors cause more or less irritation to the peritoneum and are therefore likely to form attachments with neighboring organs as the result of localized adhesive inflammation.

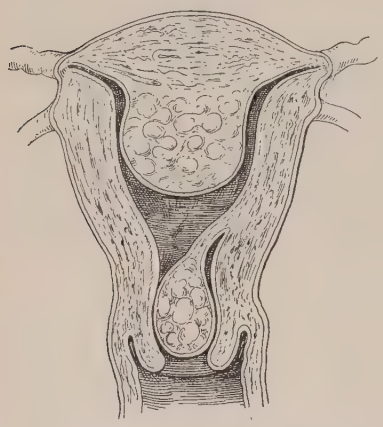


Fig. 414.—Submucous Fibroid Tumor of the Uterus and a Fibroid Polypus.

Submucous Fibroids.—These tumors are usually single, although they may occasionally be multiple. The tumor begins, as in the subperitoneal variety, as a sessile growth, but as it develops and pushes further and further into the uterine cavity it gradually becomes more and more pedunculated until finally it has a distinct pedicle which varies in length and thickness. These pedunculated submucous fibroids are known as *fibroid polypi*, and are frequently met in women during menstrual life. A fibroid polypus generally starts from the body of the uterus, but in rare cases it may originate in the cervix. It is a vascular tumor, usually somewhat soft, and varies greatly in size from a small mass to one as large as a man's fist or even larger. It may become edematous and slough as the result of torsion or constriction of its pedicle, or the mucous membrane covering it may become ulcerated from overstretching. A polypus is apt to excite uterine contractions which frequently result in its spontaneous expulsion through the cervical canal, and in rare instances, when the pedicle is short or attached to the fundus, the uterus may become inverted.

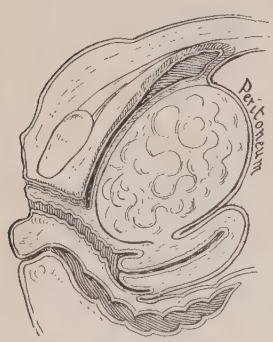


Fig. 415.—Anterior.

Fig. 416.—Posterior.

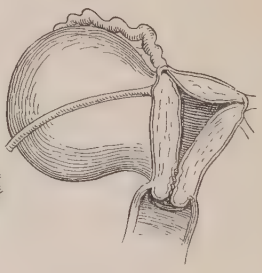


Fig. 417.—Lateral.

Intraligamentous Fibroid Tumors of the Uterus.

Intraligamentous Fibroids.—These tumors on account of their situation

cause painful and serious pressure symptoms and are also the most difficult to manage from a surgical standpoint. They may develop from the anterior or posterior portion of the supravaginal cervix and from the lateral aspect of the body of the uterus or the cervix.

An *anterior tumor* grows forward and upward and carries with it the peritoneum and bladder, which are often found flattened out upon the anterior surface of the growth. A *posterior tumor* grows backward and upward, pushes up the culdesac of Douglas, and becomes retroperitoneal. A *lateral tumor* separates the layers of the broad ligament, displaces the pelvic structures, causes serious pressure symptoms, and may eventually extend into the abdomen and carry with it all the overlying organs.

Changes in the Uterus.—Fibroid tumors cause general hypertrophy of the muscular wall of the uterus. The degree and extent of the enlargement depend upon the variety and situation of the growth. The hypertrophy is more marked in the interstitial and submucous tumors than in the subperitoneal and intraligamentous. Although, as a rule, the uterine wall is always more or less enlarged in all varieties, yet it is not uncommon to find one or more small subperitoneal nodules without any increase in the size of the uterus. As has already been mentioned, the general hypertrophy of the uterus is sometimes so great that it forms a tumor filling the abdominal cavity. The uterine canal usually increases in size proportionately with the general enlargement of the organ, but in the case of submucous tumors it sometimes becomes enormously dilated and stretched when the growth becomes more or less pedunculated. The increased weight of the uterus causes it to become retrodisplaced and prolapsed unless the tumor attains a large size and occupies the abdominal cavity.

The endometrium is often the seat of an interstitial or a glandular hypertrophy, and in submucous tumors it may become edematous and eventually ulcerate as the result of pressure.

Effect upon Neighboring and Distant Organs.—The oviducts are often displaced and bound down by adhesions. They may also become occluded and contain serum, blood, or pus (*hydrosalpinx*, *hematosalpinx*, or *pyosalpinx*). As a rule, the ovaries are enlarged; their capsules are hypertrophied, they become adherent and displaced, and often flattened by the pressure of the tumor. In some cases the uterine appendages are so completely buried by adhesions that it is difficult or impossible to find them until after the growth is removed. The blood-supply of the uterus is greatly increased in amount and the arteries and veins are immensely enlarged. The uterine ligaments also become hypertrophied and stretched and the veins, especially of the broad ligaments, are varicosed and excessively distended. Adhesions are apt to occur between the tumor and the peritoneum as the result of friction which produces a localized adhesive inflammation. In some cases these adhesions are very extensive and the growth is found to be firmly united with many of the abdominal and pelvic viscera. Sometimes the peritonitis may be due to the extension of an inflammation from the tumor itself, and when this is septic in character death may result from a general infection of the peritoneum. And, finally, a large and movable tumor may irritate the peritoneum and cause ascites. Serious and annoying complications are sometimes caused by pressure of the tumor upon the bladder, the rectum, or the urethra. These conditions are especially likely to occur when the tumor crowds the pelvic organs and when it is intraligamentous in position. Under these circumstances urination is interfered with and vesical irritability results, or there is retention of urine from pressure upon the urethra. Hemorrhoids and constipation are also of frequent occurrence when the growth presses on the rectum, and the general health of the patient may suffer from the ab-

sorption of fecal materials by the blood. Grave lesions are sometimes caused by pressure upon the ureters, which may become dilated and undergo organic changes. Under these conditions hydronephrosis may occur or the kidney and its pelvis may become inflamed and suppurative pyelitis may result.

Large abdominal fibroids may cause structural changes in the heart and liver. The left side of the heart becomes hypertrophied and dilated and its muscle undergoes fatty degeneration or brown atrophy. The liver may also be the seat of a fatty degeneration.

Secondary Changes in the Tumor.—The following degenerative changes may occur in uterine fibroids:

Atrophy.	Necrobiosis.
Calcification.	Amyloid Degeneration.
Fatty Degeneration.	Colloid and Myxomatous Degeneration.
Infection.	Cystic Degeneration.
Edema.	Sarcoma.
	Carcinoma.

Atrophy.—Sometimes a fibroid tumor undergoes senile changes and atrophy along with the uterus after the menopause. It then becomes reduced in size and harder in consistency, and may either disappear altogether or remain for an indefinite length of time. Fibroid tumors have also been known to disappear after pregnancy by undergoing involution along with the organs of generation.

Calcification.—This change occurs as the result of a deposit of lime salts (carbonate and phosphate of lime) and usually takes place in tumors after the menopause. It is not an uncommon degeneration and is more often observed in subperitoneal tumors than in other varieties. The lime salts are deposited either in the tumor or in its capsule. In the former case small particles of lime may be found scattered throughout the tumor or the entire growth may be affected, forming what is known as a *womb-stone*. Upon section these stones show the concentric arrangement of the bundles of fibrous tissue which originally composed the tumor. When the lime salts are deposited in the capsule, they form a hard shell which more or less completely surrounds the tumor.

Fatty Degeneration.—This secondary change may involve only a portion of the tumor and form cystic spaces in the growth, or the entire neoplasm may be affected and the muscular tissue completely destroyed. It is a very rare condition and is most frequently observed in tumors after the menopause and in those cases in which the growth spontaneously disappears after pregnancy.

Infection.—Inflammation of a fibroid tumor is not an uncommon occurrence and it is likely to be followed by suppuration and gangrene. It is usually caused by infection from a dirty sound or an instrument which is introduced into the uterine cavity, or it may result from a surgical operation upon a submucous tumor or a polypus. In rare cases infection has occurred from the intestines and rectum when they have become adherent to the tumor. A fibroid polypus is more liable to infection than other varieties on account of the frequency of ulceration occurring in the mucous membrane which covers it, and also because of the likelihood of its circulation being interfered with as the result of pressure or constriction.

Edema.—This condition may be due to inflammation or it may result from a temporary interference with the circulation of the uterus, and it has also been observed during pregnancy and at the menstrual periods, especially in young women. When a tumor becomes edematous, it rapidly enlarges, undergoes softening, and is filled with serum, which may enormously dilate the lymph-spaces in some cases and produce a pseudo-cystic degeneration.

Necrobiosis.—This is a frequent secondary change in uterine fibroids, as shown by Cullingworth, who recently reported fifteen instances of necrosis without infection in a series of one hundred cases. The necrobiotic degeneration usually involves only a part of the neoplasm and occurs in patches, but in other cases it may affect the entire growth. It attacks most frequently the interstitial variety and the subperitoneal tumors with a sessile base. According to the above statistics, the youngest woman was only twenty-seven years of age and the oldest sixty-two years; she had passed the menopause at fifty. There is always danger of septic infection occurring in a tumor the seat of this form of degeneration.

Amyloid Degeneration.—This is a very rare condition. Only one case thus far has been observed.

Colloid and Myxomatous Degenerations.—These conditions are rare and they may result in cystic changes in the tumor.

Cystic Degeneration.—The causes of cystic degeneration occurring in fibroid tumors are considered as follows:

1. Lymphangiectatic tumors, in which the lymph-spaces are enormously dilated and form large cavities which are lined with endothelial cells and which are filled with a clear fluid that coagulates upon exposure to the air. This variety is the most frequent form of cystic degeneration.

2. Colloid and myxomatous degenerations may be followed by the development of a fibrocystic tumor. The mucoid substance under these circumstances is enclosed in spaces within the tissues of the growth which are not lined with endothelial cells, as in lymphangiectatic tumors.

3. Cavities may be formed in a tumor from any variety of degeneration which undergoes softening and subsequent deliquescence as the result of impaired nutrition. These cases are examples of necrobiosis or necrosis without infection, and they may occur when fatty or sarcomatous changes are present in a fibroid growth. The material contained in these cysts is thick and opaque, and blood may also be present as the result of an intracystic hemorrhage.

4. The cavernous fibroid is due to dilatation of the blood-vessels in the neoplasm (*telangiectasis*). In some cases small venous cavities are found filled with fluid or clotted blood.

Sarcoma.—There is now no doubt that myofibromata of the uterus may undergo sarcomatous degeneration. This fact has been demonstrated by Virchow, Cullen, and other investigators who have observed this form of malignant change in these tumors.

Carcinoma.—While carcinoma should not properly be included among the degenerative changes in fibroid tumors, for the reason that it is impossible for the growth itself to undergo cancerous transformation, yet as the two conditions occasionally coexist it was thought proper to refer to the subject under the above classification.

Symptoms.—The symptoms are classified under the following headings:

Hemorrhage.	Pain in the surrounding parts.
Leukorrhea.	Urinary organs.
Pain in the tumor.	Rectum.

General symptoms.

Hemorrhage.—Hemorrhage is the most constant and the most significant symptom. It usually increases the amount and duration of the menstrual flow (*menorrhagia*), and in some cases it eventually occurs also between the periods. After being severe for a long time the bleeding may cease altogether and return again in several months, or it may continue indefinitely. As a rule, muscular exertion, sexual intercourse, and emotional influences increase the quantity of the hemorrhage. If the tumor undergoes atrophy at the time of the menopause,

the bleeding gradually lessens and finally stops entirely. Sometimes a woman who has had no hemorrhage for several years after the change of life will suddenly begin to bleed, and an examination will reveal an ulcerated fibroid polypus. The blood is usually in a liquid state, but in some cases when the patient is in the recumbent position for several hours large vaginal clots are formed which are expelled as soon as she assumes the erect posture. When the clots are retained in the vagina for a long time, they are apt to become decomposed and ill-smelling.

The severity and duration of the hemorrhage depend upon the situation and character of the tumor. A fibroid polypus is generally accompanied with constant bleeding and also an increase in the quantity of the menstrual flow; submucous and interstitial growths, as a rule, cause menorrhagia alone; subperitoneal fibroids, especially the pedunculated variety, have but little, if any, effect upon menstruation; and the intraligamentous tumors are often the cause of excessive hemorrhage during the periods. A true myoma and an edematous fibroid cause profuse bleeding during menstruation, and at times also a metrorrhagia.

The bleeding in uterine fibroids is due to a hemorrhagic endometritis which is caused by the presence of the tumor, and in some cases it may come directly from the capsule of the neoplasm when it has been exposed by atrophy or ulceration of the endometrium.

In exceptional cases, even in large tumors, hemorrhage (*menorrhagia* and *metrorrhagia*) is absent as a symptom.

Leukorrhea.—This is a more or less constant symptom and is due to an excessive secretion of the uterine glands (*hydrorrhea*). The discharge is generally serous in character and very profuse. Sometimes it may be mixed with blood or it may become purulent, especially in cases of sloughing polypi.

Pain in the Tumor.—Pain occurring in the tumor itself is a very significant symptom of some secondary change taking place. Under these circumstances the pain is not only spontaneous, but it is also evoked by pressure. Pain may also be caused by a rapidly growing interstitial tumor stretching the walls of the uterus, or there may be expulsive pains, which are intermittent in character, that are due to the presence of a submucous growth or a polypus.

Pain in the Surrounding Parts.—Pain is a more or less constant symptom of uterine fibroids; it is more marked when the tumor is situated in the pelvic cavity, especially the intraligamentous variety, and it always increases in severity during the menstrual periods. The causes of pain are various. It may be due to pressure or traction upon adjacent organs; to disease of the uterine appendages or neighboring parts; and to local peritonitis or adhesions. There is usually a sensation of fullness and weight in the pelvis and localized pain in the lumbosacral region. Pressure upon the pelvic nerves results in neuralgic pains which may be referred to various parts of the body, as the pelvis, the abdomen, the head, and the lower extremities.

Urinary Organs.—As has already been mentioned hydronephrosis may occur from pressure upon the ureters, or the kidney and the renal pelvis may become inflamed and suppurative pyelitis result. Vesical symptoms are very frequent, especially when the tumor occupies the pelvic cavity or it is intraligamentous, or grows from the anterior surface of the uterus. Under these circumstances the capacity of the bladder may be lessened and a constant desire to urinate result, or there may be an obstruction to the flow of urine, which is so marked in some cases that it is almost impossible to introduce a catheter.

Rectum.—Constipation and hemorrhoids are a frequent result of tumors that press upon the lower bowel.

General Symptoms.—The health of the patient suffers from the continuous hemorrhage, the leukorrhea, the pain, the effect upon neighboring and distant organs from the presence of the tumor, and from the secondary changes which take place in the growth itself. Profound anemia is the rule in bad cases and the character of the blood is still further impaired by the copremia which results from chronic constipation. Patients, as a rule, become exhausted and lose weight, except in uncomplicated cases, when it is not unusual for them to gain flesh and become fat. In some cases there may be muscle disease of the heart (*fatty degeneration* or *brown atrophy*), or, again, the left side of the organ may become hypertrophied and dilated. The liver may at times be the seat of fatty changes and the pressure of the tumor may cause an enlargement of the veins of the abdomen or ascites. Sometimes edema of the legs is marked and temporary paralysis may occur in the lower extremities from pressure.

Prognosis.—The earlier views in regard to the prognosis of uterine fibromyomata have not stood the test of time, and, as the result of a more extended and practical experience, these neoplasms are now considered to be dangerous to life and frequently the cause of chronic invalidism. While it is true that even a large fibroid may cause no marked symptoms during menstrual life, that these neoplasms may atrophy and disappear at the menopause or after pregnancy, and that a submucous tumor may eventually be spontaneously expelled as a fibroid polypus, it is also equally true that these results are the exception and not the rule, and that death may occur while the patient vainly waits for a favorable ending to her condition. According to the investigations of Noble, death results in 33 per cent. and chronic invalidism in 25 per cent. of all cases not operated upon.

The reasons for the dangerous outlook in cases of uterine fibromyomata are not difficult to discover when we consider the effect of the tumor upon neighboring and distant organs, the secondary degenerative changes in the growth itself, and the exhausting nature of the symptoms which are dependent upon the presence of the neoplasm. The danger to life before or after operative interference from organic lesions of the heart and kidneys has been frequently demonstrated. Peritoneal inflammations and adhesions have produced grave conditions, as shown in a case reported by Cullingworth, "of a sloughing interstitial fibromyoma in which the slough had ulcerated through the uterine wall into the peritoneal cavity and had there infected the wall of the transverse colon, to which it was adherent, with the result of causing several intestinal perforations." And, finally, the danger of the oviducts becoming infected must also be considered.

Degenerative changes in the tumor itself are both frequent and dangerous to life, and in view of our present knowledge upon the subject the prognosis of uterine fibroids must be guarded. In a series of 100 cases Cullingworth found that "in no fewer than 52 cases, or rather more than one-half of the whole series, the tumors had undergone some form of secondary (degenerative) change." The calcareous and fatty forms of degeneration are the least dangerous of the secondary changes. Infection is likely to be followed by suppuration and gangrene. Edema is usually associated with rapid enlargement of the tumor and severe hemorrhage. Colloid and myxomatous changes may be followed by the formation of cavities in the tumor. A telangiectatic fibroid may cause sudden death from embolism and a fibrocystic tumor may endanger the patient's life from exhaustion or it may rupture spontaneously into the peritoneal cavity. Sarcomatous degeneration is a danger always to be considered, and the fact that cancer may attack the cervix or endometrium should not be lost sight of.

The profound anemia that accompanies cases of fibroid tumors of the uterus which are characterized by continuous or repeated hemorrhages is one of the

most dangerous symptoms resulting from the disease. These patients have no reserve power whatever, and they often succumb to a trifling intercurrent affection that under ordinary circumstances would not have a fatal issue. The health is further undermined by leukorrhea and pain in the surrounding parts, which is usually the result of pressure; and, finally, chronic constipation, by causing copremia, destroys the quality of the blood and impairs the vitality of the general system.

From what has been said the causes of death and chronic invalidism in uterine fibromyoma are easily understood. While sudden death from hemorrhage is unusual, the effect produced by the constant loss of blood is apparent in the anemic state of the patient. Fibroids of the uterus, as a rule, delay the menopause for several years. There is always a relative sterility, and if conception occurs there is danger of abortion or premature labor resulting. If the pregnancy goes on to full term the delivery of the child through the natural passages may be extremely difficult or even impossible on account of the mechanic obstruction caused by the tumor.

The effect of the menopause upon the growth of uterine fibroids is very uncertain. In my experience I have seldom seen the retrograde changes spoken of by the older writers take place, and the tumors have either ceased to grow and remained stationary for an indefinite length of time or they have become active again several years after the menopause.

Diagnosis.—The diagnosis of uterine fibromyomata is not, as a rule, difficult, and is made by the history of the case, the general subjective symptoms, and a physical examination of the tumor. The history and subjective symptoms have already been discussed, and it is therefore unnecessary to refer to them again, except to call attention to the fact that they are often important as an aid in the diagnosis of these neoplasms. The physical examination reveals the origin, the situation, and the characteristics of the tumor. From a diagnostic standpoint each variety of uterine fibroid must be considered separately, as follows:

1. Interstitial fibromata.
   (*a*) Pelvic in situation; (*b*) Abdominal in situation.
2. Subperitoneal fibromata.
   (*a*) Pelvic in situation; (*b*) Abdominal in situation.
3. Submucous fibromata.
4. Uterine polypi.
5. Intraligamentous fibromata.
   (*a*) Between the folds of the broad ligaments; (*b*) Posterior tumors; (*c*) Anterior tumors.

Anesthesia.—General anesthesia should always be employed in doubtful cases. It is important to have the abdominal muscles thoroughly relaxed when making the examination, otherwise it is impossible to determine the origin, the situation, and the characteristics of the tumor. An anesthetic is, therefore, indicated in small tumors, especially when they are associated with a lesion of an adjacent organ, in nervous and unmarried women and in patients who have a fat or muscular abdomen.

Methods of Diagnosis.—Inspection.—The patient is placed in the horizontal recumbent position. The examination reveals the symmetry or asymmetry of the abdomen, the probable origin of the tumor, the smoothness or unevenness of the surface of the abdominal walls, and the dilated or normal condition of its veins.

Abdominal Palpation.—The patient is placed upon her back with the knees drawn up and the shoulders slightly raised with a pillow. The exami-

nation shows the origin and boundaries of the tumor and its consistency, shape, and surface conditions.

Percussion.—The patient is placed in the horizontal recumbent position. The examination demonstrates the origin and boundaries of the tumor and the absence or presence of fluctuation.

Mensuration.—The patient is placed in the horizontal recumbent position. The examination determines the symmetry or asymmetry of the abdomen.

Auscultation.—The patient is placed in the horizontal recumbent position. The stethoscope reveals the uterine souffle when it is present.

Vagino-abdominal Palpation.—The patient is placed in the dorsal position. The examination reveals the size, the situation, the consistency, the mobility, and the surface conditions of the tumor. It also shows the relations of the tumor with the lower part of the rectum and the bladder; the condition and the surroundings of the intravaginal and supravaginal portion of the cervix, and the state of the vaginal vault.

Recto-abdominal Palpation.—The patient is placed in the dorsal position. The examination reveals the surface conditions of the posterior aspect of the tumor and its retrouterine relations.

Vesico-abdominal Palpation.—The patient is placed in the dorsal position and a sound is introduced into the bladder. This method is used to demonstrate the relations existing between the bladder and the tumor.

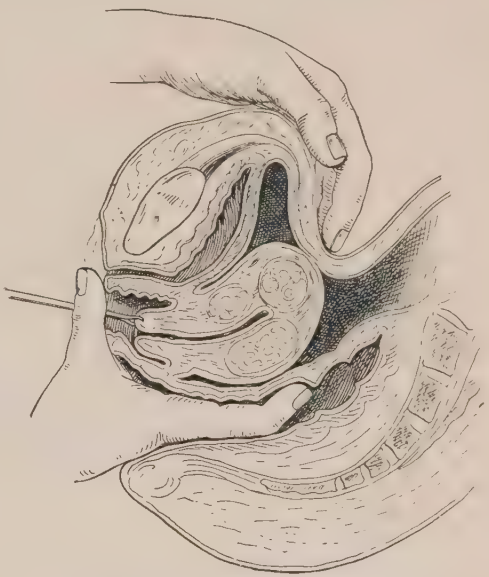


Fig. 418.—Diagnosis of Interstitial Fibroids of the Uterus by Artificial Uterine Prolapse Combined with Recto-abdominal Touch.

Interstitial Fibromata.—Pelvic in Situation.—*Vagino-abdominal Palpation.*—When the tumor is accompanied with general fibroid hypertrophy the uterus is found to be enlarged, hard and symmetric in shape, and its external surface smooth. If the uterus is not uniformly hypertrophied, the organ is asymmetric in shape and enlarged on the side of the tumor. In the case of a true myoma the uterus is soft in consistency and a sensation of fluctuation is imparted to the examining fingers.

Recto-abdominal Palpation.—Sometimes it is necessary to make a more thorough examination by seizing the cervix with bullet-forceps and pulling the uterus down, while at the same time the posterior surface of the neoplasm is explored by recto-abdominal touch (artificial uterine prolapse, p. 306).

Abdominal in Situation.—*Inspection.*—The abdomen is enlarged and symmetric in shape except when the general fibroid hypertrophy is not uniform, in which case the symmetry is destroyed and there is a distinct bulging upon

the side on which the tumor is situated. The surface of the abdomen is smooth and regular and its lower is more prominent than its upper portion owing to the pelvic origin of the growth. The superficial veins in the abdominal wall are found to be dilated when the tumor obstructs the circulation.

Abdominal Palpation.—The pelvic origin and the boundaries of the tumor are first ascertained, and then its shape, consistency, and surface conditions are determined. Its shape may be symmetric or asymmetric, depending upon the character of the general fibroid hypertrophy. If the enlargement is uniform, it is globular or ovoidal in shape, but if otherwise a prominence will be felt through the abdominal wall upon the side of the uterus on which the tumor is situated. The consistency of the neoplasm is hard, non-elastic, and unyielding except in the case of a myoma, when it is soft and apparently fluctuating. The external surface is smooth and regular except where one of the tumors shows a tendency to become subperitoneal, in which case a slight bulging will be felt at that point.

FIG. 419.—DIAGNOSIS OF INTERSTITIAL FIBROIDS OF THE UTERUS BY VAGINO-ABDOMINAL TOUCH. Showing the connection between the tumor and the uterus.

Percussion.—This method of examination determines the pelvic origin and boundaries of the tumor and the absence of fluctuation.

Mensuration.—The symmetry or asymmetry of the abdomen is determined by comparing the measurements between the ensiform cartilage and the anterior superior spinous processes of the ilium.

Auscultation.—The uterine souffle is frequently heard in these tumors.

Vagino-abdominal Palpation.—A mass is felt extending from the pelvis into the abdomen which may be symmetric or not according to the uniformity of the general fibroid enlargement. The tumor is hard and unyielding except in the case of a myoma, when it is soft and fluctuating. The external surface is smooth and regular except where there is a tendency toward the formation of a subperitoneal growth. The abdominal portion of the enlargement is shown to be a part of the uterus by pressing down upon the mass through the abdominal wall and at the same time placing the vaginal finger against the cervix. The force from

above is thus not only communicated to the cervix, but the lower segment of the uterus and the tumor can be pushed upward by the vaginal finger or pressed downward by the abdominal hand.

Recto-abdominal Palpation.—A combined examination through the rectum enables the surgeon to explore the posterior surface of the tumor and confirm the results already obtained.

Subperitoneal Fibromata.—As subserous fibroids are, in nearly all cases, associated with interstitial tumors, and also with more or less general fibroid hypertrophy of the muscular walls of the uterus, it naturally follows that the clinical characteristics of the latter variety are found to be present upon examination. Therefore in discussing the diagnosis of subperitoneal tumors no reference will be made to the interstitial variety, as it would otherwise be a repetition of what has already been said upon the subject.

Pelvic in Situation.—*Vagino-abdominal Palpation.*—Nodules of various size are felt upon the surface of the uterus, some of which are sessile and others pedunculated. The sessile tumors are closely connected with the uterus and cannot be moved in any direction without displacing the entire organ. The pedunculated growths are distinctly felt by the examining finger to be separated from the uterus and they can be moved about within certain limits without affecting the position of the organ. A large pedunculated fibroid may block up the pelvic cavity and crowd against the uterus, in which case it is impossible to distinguish it from a sessile growth. Subperitoneal fibroids always displace the uterus unless they are small, in which case they do not materially affect its position. It is not uncommon to find one or more small fibroid nodules upon the external uterine surface that cause no subjective symptoms whatever. Subserous fibroids are hard and unyielding to the touch, and they may be round, oblong, or ovoid in shape.

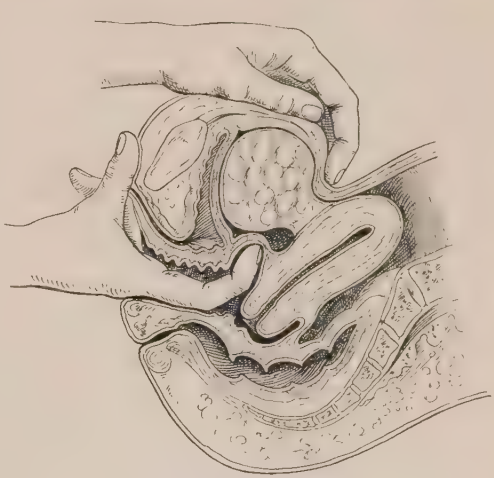


FIG. 420.—DIAGNOSIS OF A PEDUNCULATED SUBPERITONEAL FIBROID TUMOR OF THE UTERUS BY VAGINO-ABDOMINAL TOUCH.

Recto-abdominal Palpation.—This method of examination confirms the results already obtained.

Abdominal in Situation.—*Inspection.*—The abdomen is enlarged and asymmetric. Its surface is irregular and nodules may be seen moving under the belly wall during the act of respiration. The symmetry of the abdomen and the appearance of its surface depend upon the size of the tumors and the general involvement of the uterus. In the case of a large subperitoneal tumor growing from the fundus of the uterus the middle portion of the abdomen may be more prominent than its lower part and thus obscure the pelvic origin of the neoplasm.

Abdominal Palpation.—The subperitoneal nodules are easily recognized by palpating the abdomen over the enlargement in various directions. They are hard and unyielding and of various shapes and sizes. The sessile tumors are

closely united with the uterus and are distinctly felt projecting from its surface. The pedunculated growths are separated from the uterus and are always more or less movable unless adhesions have formed with a fixed point in the abdomen.

Mensuration.—The abdomen is asymmetric in large tumors.

Vagino-abdominal Palpation.—The enlarged uterus is felt extending from the pelvis into the abdominal cavity and the sessile nodules are easily recognized as they project from its surface. A pedunculated growth may be moved about within certain limits by pressure through the abdominal walls, but so soon as its pedicle is put upon the stretch the uterus is displaced and the movement is transmitted through the cervix to the vaginal finger.

Recto-abdominal Palpation.—This method of examination confirms the results already obtained.

Submucous Fibromata.—Vagino-abdominal Palpation shows the uterus to be enlarged and more or less globular in shape. As a rule, the tumor is associated with the interstitial and subperitoneal varieties, which give their own peculiar clinical characteristics to the enlarged uterus. It is impossible to diagnose a submucous tumor without exploring the uterine cavity. It is, however, of no practical importance to know for certain that a submucous growth exists in a case in which there are interstitial or subperitoneal fibroids, but when the uterus shows no evidence of general involvement the uterine cavity must be explored to determine the cause of the hemorrhage. Under these circumstances the cervix should be forcibly dilated and the uterine cavity examined with the index-finger and the uterine sound. The canal of the uterus will be found greatly lengthened and enlarged and often more or less distorted; and the finger will feel the tumor projecting into the uterine cavity.

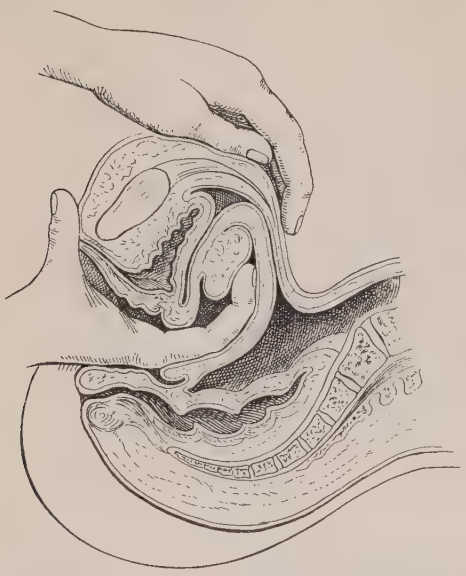


FIG. 421.—DIAGNOSIS OF A SUBMUCOUS FIBROID TUMOR OF THE UTERUS BY ABDOMINAL TOUCH COMBINED WITH THE INDEX-FINGER IN THE UTERINE CAVITY.

Uterine Polypi.—The same indications exist for the necessity of a positive diagnosis in fibroid polypi as in the case of a submucous tumor. There is, however, less likelihood of general involvement of the uterus in the former variety, and consequently an examination of the uterine cavity is more frequently required. The examination should be made with the index-finger and the uterine sound after forcible dilatation of the cervix. The uterine canal will be found lengthened and enlarged and the tumor attached by a pedicle and not by a broad base as in the submucous variety. Sometimes a polyp may be found in the cervical canal, or again it may have been expelled from the uterus into the vagina, where it is seen hanging from a pedicle attached to the endometrium. It sometimes happens that a polypus is temporarily forced into the cervical canal (*intermittent polypus*) by the expulsive pains that occur during menstruation which

are excited by the presence of the tumor, and thus a pedunculated growth which is easily discovered by sight and touch at these periods is at other times too high up in the uterine cavity to be recognized except after forcible dilatation of the cervix.

Intraligamentous Fibromata.—Between the Folds of the Broad Ligaments.—This form of intraligamentous tumor is readily recognized by *vagino-abdominal* and *recto-abdominal* touch. The neoplasm grows from one or both sides of the uterus and from the supravaginal portion of the cervix and projects between the folds of the broad ligaments. It is hard and unyielding in consistency, sessile in character, and usually occupies a low position in the pelvis, being situated just above the lateral culdesacs of the vagina, which are often more or less depressed or flattened out. Sometimes, however, these growths occupy one or both of the iliac fossas, and are intimately connected with the uterus. When the tumor is unilateral, the uterus is displaced toward the opposite side; but when it is bilateral, the pelvic cavity becomes blocked and the structures firmly wedged.

Posterior Tumors.—The examination is made by *vagino-abdominal* and *recto-abdominal palpation*. The tumor grows from the posterior surface of the supravaginal portion of the cervix and develops backward and upward, pushing up the culdesac of Douglas and becoming retroperitoneal. It eventually raises the uterus out of the pelvis and becomes firmly attached to the pelvic floor. The uterus and the tumor thus form a solid, immovable mass which is apparently retroperitoneal in origin. The vaginal vault is flattened out or depressed and the intravaginal portion of the cervix may be entirely taken up by the neoplasm, leaving nothing but the external os uteri to mark its original position in the vagina. Hard fibrous nodules are felt posterior to the os uteri which are firmly attached to the cervix.

Anterior Tumors.—The examination is made by *vagino-abdominal* and *vesico-abdominal palpation*. The tumor grows from the anterior surface of the supravaginal portion of the cervix and develops upward and forward, carrying with it the reflection of peritoneum and the bladder, which are often found flattened out upon the anterior face of the neoplasm several inches above the symphysis pubis. Vagino-abdominal touch determines the position of the growth, the obliteration of the vaginal culdesac, and the absence of the intravaginal portion of the cervix if it has been taken up by the tumor. By introducing a sound into the bladder and at the same time making pressure through the abdominal wall above the symphysis pubis we are able in some cases, if the abdomen is not too fat, to demonstrate the elevated position of the organ upon the tumor. The direction of the sound and feeling its tip through the belly wall are the guides in this method of examination.

Diagnosis of Secondary Changes in the Tumor.—Secondary changes occurring in the tumor itself are, as a rule, not even suspected until a section is made of the neoplasm after its removal. The reason for this is that it is practically impossible to diagnose these changes prior to operation, as there are no subjective or objective symptoms, in the majority of instances, which have any diagnostic value whatever. This statement applies more especially to calcareous, fatty, necrobiotic, amyloid, colloid, and myxomatous degenerations. On the other hand, however, such changes as infection, edema, cystic degeneration, sarcoma, and carcinoma present certain symptoms which may in some instances enable us to make a positive diagnosis, and in other cases to have at least a strong suspicion of the probable condition.

Pain.—Pain occurring in the tumor itself is a very significant symptom of some

secondary change taking place unless it is due to a rapidly growing interstitial fibroid stretching the walls of the uterus or to a submucous growth or a polypus irritating the uterine cavity. Again, it must be remembered that pain in the surrounding parts may be due to pathologic conditions in structures and organs so close to or intimately connected with the uterus that it is sometimes difficult or impossible to locate the symptom in the tumor itself. There is nothing distinctive in the character of the pain that is due to a secondary change which would lead us to suspect the presence of a degeneration unless we are able to exclude all other causes for the symptom and it occurs in a tumor that has been quiescent for a long time and then more or less suddenly becomes tender and painful.

Infection.—Inflammation is not an uncommon occurrence and it is likely to be followed by suppuration and gangrene. It begins, like all septic infections, with an elevated temperature and pulse, which may be preceded by a chill. The tumor rapidly enlarges in size and is the seat of severe pain and extreme tenderness upon pressure. The history of the case is often an important aid in the diagnosis, as it may point to the cause of the infection. Thus, for example, the above symptoms may follow the introduction of a uterine sound or an operation upon a submucous tumor or a polypus. The danger of infection from the intestines or the rectum where adhesions exist must also be remembered.

Sloughing and gangrene are likely to occur in a fibroid polypus, and also occasionally in a submucous tumor. If the process is confined to the polyp, the condition will manifest itself by a profuse, purulent, fetid, and sanious discharge; but if the uterus becomes infected, symptoms of general septicemia are also present. A positive diagnosis must be made in these cases by exploring the uterine cavity after forcible dilatation of the cervix and submitting some of the diseased tissue to a microscopic examination. If a polypus becomes gangrenous after being expelled from the uterus, the diagnosis is readily made by direct inspection through a speculum. Even under these circumstances, however, the microscope should be employed to guard against error.

Edema.—This change often occurs in fibroid tumors in women before the age of thirty years. It may be associated with inflammation of the tumor or it may be entirely independent of it. The fibroid suddenly increases in size and becomes very soft in consistency. It gives a sensation of fluctuation to the examining fingers and closely resembles an ovarian cyst in many of its physical characteristics. It is usually accompanied by severe uterine hemorrhage. While the diagnosis is frequently impossible, yet a strong probability as to the nature of the disease may be arrived at by a careful study of the symptoms and the history of the case, together with a thorough examination of the tumor and its relations with the uterus.

Cystic Degeneration.—Cystic degeneration of uterine fibroids is comparatively frequent, but it is rarely met in women under thirty-five years of age. When this degeneration attacks a tumor, it increases in size with greater rapidity than is the case in normal uterine fibromata. Palpation demonstrates the existence of one or more cysts situated at different parts of the tumor and reveals the fact that they are surrounded or separated from each other by hard fibrous tissue. This is characteristic of these cysts, as they do not involve the entire tumor but only portions of it. By vagino-abdominal palpation we find that the cystic tumor is a part of the uterus, and it is not uncommon to feel hard fibroid nodules below the cyst in the lower segment of the uterus.

A continuous buzzing murmur and thrill are often heard in telangiectatic tumors.

Sarcoma; Carcinoma.—The diagnosis of malignant diseases of the uterus is discussed in their respective chapters.

Differential Diagnosis.—Uterine fibromata must be distinguished from the following conditions:

Pregnancy.	Cystic tumors of the ovary.
Displacements of the uterus.	Solid tumors of the ovary.
Inversion of the uterus.	Broad ligament tumors.

Pregnancy.—As a rule, the differential diagnosis between a uterine fibroid and pregnancy is not difficult unless the tumor is a true myoma, in which case a mistake may readily be made unless great care is taken in making the examination and in eliciting the history of the case. In doubtful cases time must be relied upon to clear up the question by developing positive signs of pregnancy. In all cases the subjective and objective signs of pregnancy and of fibroid tumors must be carefully studied before coming to a conclusion as to the nature of the enlargement. When, however, the fetal heart-sounds are recognized by auscultation or the different parts of the fetus are felt by abdominal palpation, the diagnosis is certain. The intermittent contractions of the uterus which occur during pregnancy cannot be relied upon, as they also take place in soft fibroids. Fetal movements are an important sign of pregnancy, but it must not be forgotten that they are absent when there is an excess of liquor amnii and when the child is weak or dead. Furthermore, these movements may be mistaken for contractions of the muscles of the abdominal wall or the peristaltic action of the intestines. The breast changes are generally absent in fibroid tumors, but the line of pigmentation on the abdominal wall between the umbilicus and the pubes, and the gastric disturbances which are so often manifested during the earlier months of pregnancy, are frequently present. In fibroid tumors the uterus is generally asymmetric and hard in consistency except in the case of a myoma, when it is, as a rule, symmetric and soft. A fibroid tumor develops much more slowly than a pregnant uterus. It must also be borne in mind that occasionally menstruation may persist during pregnancy and that a fibroid may not be accompanied with either menorrhagia or metrorrhagia. The uterine souffle is not always present in fibromata and the umbilicus does not present the changes of pregnancy. The purple or violet discoloration of the vulvovaginal orifice and the throbbing of the arteries of the vagina are valuable signs of pregnancy. Softening of the cervix is also an important aid in the diagnosis of pregnancy, but mistakes are apt to be made if too much reliance is placed upon this symptom. I have observed softening of the uterine neck in several cases of true myoma, and in all of these patients the differential diagnosis was extremely difficult.

The possible coexistence of pregnancy and fibroma must always be remembered, as it is not an unusual complication in uterine fibroids. In a woman who is exposed to pregnancy the sudden and rapid enlargement of a tumor previously more or less quiet and stationary is very significant.

Displacements of the Uterus.—A small subperitoneal tumor situated on the anterior or posterior surface or on the side of the uterus may be mistaken for a forward, backward, or lateral uterine displacement. The differential diagnosis which is made by *vagino-abdominal* and *recto-abdominal palpation* will reveal the characteristics of the tumor and the true position of the fundus of the uterus.

Inversion of the Uterus.—A large fibroid polypus that has been expelled from the uterus into the vagina may be mistaken for a uterine inversion. In the case of a polypus recto-abdominal and vagino-abdominal palpation will demonstrate the presence of the fundus in its normal position and the absence of a cup-shaped depression above the cervix. If the case is one of inversion of the uterus,

the fundus is found to be absent; there is a cup-shaped depression above the cervix and the sound will not pass beyond the cervical collar or rim.

Cystic Tumors of the Ovary.—There should be no difficulty in distinguishing between a cyst of the ovary and a uterine fibroma after a careful study of the history of the case and a thorough examination of the tumor. The diagnosis, however, is often impossible in cases of fibrocystic or edematous uterine tumors and where the ovarian neoplasm is adherent to the uterus. Fibrocystic tumors do not involve the entire growth but only portions of it, and abdominal palpation reveals areas of hard fibrous tissue between the cysts. By vagino-abdominal palpation the tumor is shown to be a part of the uterus, and it is not uncommon to feel hard nodules in the lower uterine segment. The fluctuation in an edematous fibroid is limited and does not involve the entire tumor, as is the case in an ovarian cyst. Unless the body of the uterus can be recognized by vaginal or rectal palpation in cases where an ovarian cyst is adherent to it a diagnosis is impossible.

Solid Tumors of the Ovary.—These neoplasms may readily be mistaken for a pedunculated subperitoneal fibroma, especially when the pedicle is long and slender. A pedunculated fibroid is usually associated with subjective and objective signs of general uterine involvement, and if both ovaries are recognized by vagino-abdominal or recto-abdominal palpation the diagnosis is certain. If, however, the ovaries cannot be felt, a diagnosis of pedunculated fibroma is justified on account of the general uterine involvement. If the case is one of an ovarian tumor, the uterus will be normal in size and consistency, although it may be displaced, and all the subjective and objective signs of fibroma will be wanting. Sometimes a solid tumor of the ovary becomes adherent to the uterus and it is impossible to make a differential diagnosis.

Broad Ligament Tumors.—Solid or cystic tumors of the broad ligament may be mistaken for intraligamentous fibroids that project between the folds of the broad ligament. A positive diagnosis is usually impossible. If the uterus is enlarged and nodular and the tumor in the broad ligament is intimately connected with it, a diagnosis of intraligamentous fibroid is justifiable, especially if the neoplasm is bilateral. But if the uterus is not enlarged or nodular and there is a depression between it and the tumor, the diagnosis should be in favor of a broad ligament growth. It must be borne in mind that these fibromata may undergo cystic degeneration and simulate cysts of the ligament.

Treatment.—I am strongly of the opinion that the vast majority of uterine fibromata demand removal. The prognosis of the disease and its history, viewed in the light of our present knowledge, can admit of no other opinion as regards the treatment of these tumors. Again, the low mortality following operations upon uterine fibroids is an additional reason why it is safer to remove them at once rather than allow the patient to expose herself to complications which are not only dangerous to life but are also destructive to health and usefulness. On the other hand, however, we occasionally meet cases where the indications are in favor of palliative treatment and in which it would be wrong to urge an immediate operation. The selection of these cases depends upon the size and situation of the tumor, the mobility of the uterus, and the absence of pressure symptoms or serious hemorrhage. A small tumor, not occupying the lower uterine segment, with the uterus freely movable and the surrounding parts not subjected to pressure, does not demand immediate operation, especially if the woman is nearing the menopause or the patient is young and desires children. But a growth situated in the lower segment of the uterus (*intraligamentous*), even if it is small in size, should always be removed, as it produces serious pressure upon the

surrounding parts, and if the woman becomes pregnant it is likely to act as an obstruction to the delivery of the child during labor.

The treatment of fibroid tumors of the uterus is divided into:

The symptomatic treatment.

Treatment preparatory to operation.

The surgical treatment.

The Symptomatic Treatment.—In addition to the indications already given for the palliative treatment, we are at times forced to resort to tentative measures because patients refuse to submit to surgical relief.

The symptoms which demand our attention are (*a*) hemorrhage, (*b*) pain, and (*c*) the results of mechanic pressure.

Hemorrhage.—This symptom is controlled by rest, vaginal injections, vaginal tampons, curetment of the uterus, and drugs.

Rest.—Rest in bed while the hemorrhage continues will aid materially in controlling the excessive bleeding in cases of menorrhagia and metrorrhagia.

Vaginal Injections.—Vaginal injections of hot normal salt solution (120° F.) should be used twice a day for an indefinite length of time. At least two gallons must be used at each injection, and the douches should not be discontinued during the menstrual periods.

Vaginal Tampons.—A vaginal tampon is a valuable aid in checking, for a time, at least, a continuous hemorrhage. Again, it is the most certain method we possess to control either an excessive hemorrhage or a prolonged or profuse menstrual flow. I have seen severe hemorrhages controlled for months by its use. The tampon is made of absorbent gauze, cut into a strip six inches wide and sufficiently long to contain enough material to thoroughly pack the vagina. A compress over the vulva and a T-bandage complete its application. It should be removed in twenty-four hours and reapplied if necessary.

Curetment of the Uterus.—Curetment of the uterine cavity may be resorted to when the hemorrhage is continuous or severe and does not yield to ordinary treatment. A sharp curet should be used and the mucous membrane thoroughly removed. This treatment is followed at once by marked improvement in the majority of cases, and is one of the very best means at our command to control the symptom under consideration.

Drugs.—The most useful drugs to control hemorrhage are ergot, hydrastis canadensis, and cannabis indica. Ergot is either administered by the mouth or hypodermically; preferably by the former method, as the injections are not only painful, but they are liable to cause abscesses. Ergotin in doses of 2 to 3 grains three times a day is the best form in which to use the drug. On account of its depressing effect upon the heart, strychnin should be given at the same time (gr. $\frac{1}{30}$ t. i. d.). The fluid extract of hydrastis canadensis and the tincture of cannabis indica may be employed where no results are derived from the use of ergot.

Pain.—The routine treatment for pain which I have found most useful consists in vaginal injections of hot normal salt solution (120° F.) twice a day and the introduction into the vagina of cotton-wool tampons saturated with a 25 per cent. solution of ichthyol in glycerin. A tampon should be introduced two or three times a week and removed on the following morning. The tincture of cannabis indica combined with sodium bromid should be administered internally.

Where pain is caused by pressure the knee-chest position gives great relief, and should be used along with the routine treatment described above. The patient should assume the position for ten or fifteen minutes three times a day—in the morning before getting out of bed, at noon, and upon retiring for the night. Another direction which should be given to the patient is to lie as much as possible, when recumbent, upon the abdomen or side, so as to remove the weight of

the tumor from the points pressed upon when in the erect or sitting position. The use of posture in the treatment of pain due to pressure has, in my hands, accomplished more than any other method of treatment.

When the pain is due to localized chronic peritonitis, salines should be employed in addition to the routine treatment, giving a sufficient quantity of the remedy to produce one watery movement daily for several days and then using the salt once a week for an indefinite length of time.

The Results of Mechanic Pressure.—In the treatment of the results of pressure upon the rectum, the bladder, the ureters, and other organs but little can be done beyond having the patient assume the knee-chest position in the manner already described. In some cases the results of this treatment are excellent, while in others there is but little difference, if any, in the severity of the symptoms. Of course, much will depend upon the size of the tumor, its situation, and also its mobility. Good results are seldom obtained in these cases from the use of tampons or supporters.

Treatment Preparatory to Operation.—The profound anemia and grave kidney complications which often exist in cases of uterine fibroids render it imperative that a thorough general examination should be made and the patient placed upon the proper treatment before subjecting her to an operation. Neglect of this precaution endangers the patient's life, as she may not only take the anesthetic badly, but death may also occur after the operation from a want of sufficient reserve force to stand the surgical shock. A careful examination must therefore be made, especially of the blood, the heart, and the urine, and the patient treated upon general medical principles when the occasion requires it.

The Surgical Treatment.—The operative procedures advised at the present time for the cure of uterine fibroids are:

Abdominal Hysterectomy.
Abdominal Myomectomy.

Abdominal Hysterectomy.—This operation is the one of selection in all forms of fibroma except in cases of uterine polypi or where the neoplasm is limited to the vaginal portion of the cervix; the treatment of these cases will be considered later on.

A hysterectomy may be either *complete* or *incomplete;* the former is known as *panhysterectomy,* or the removal of the entire uterus; and the latter as *supravaginal hysterectomy,* or amputation of the organ at its junction with the cervix.

The selection of these operations depends upon the indications in a given case. Panhysterectomy is indicated in sloughing fibroids with general infection or when malignant disease is associated with the tumor. On the other hand, supravaginal hysterectomy is always the preferable operation when these conditions are absent. The advantages of supravaginal hysterectomy over total removal of the uterus are as follows: The mortality is lower; the operation is more quickly performed; the hemorrhage is less and more easily controlled; the dangers of sepsis are minimized, as the vaginal canal is not opened; the capacity of the vagina remains the same and consequently there is no shortening to interfere with sexual intercourse; and, finally, a vaginal hernia cannot result.

The technic of both operations is described on pages 984 and 996.

Abdominal Myomectomy.—The object of this operation is to

remove the tumor without sacrificing the uterus. The indications for myomectomy are not fully determined upon at the present time. It is undoubtedly a more dangerous operation than hysterectomy, as secondary hemorrhage and sepsis are post-operative complications which are always to be feared, especially in cases where large interstitial tumors are enucleated. The operation should be restricted to pedunculated subperitoneal tumors where the uterus is not involved. Another class of cases in which enucleation may be resorted to is where the uterus is not enlarged and small sessile subserous nodules project upon its surface. And, finally, a small interstitial tumor or several growths localized in a circumscribed area in the uterine wall may be removed without taking away the uterus.

Unfortunately, however, myomectomy is seldom indicated, as the uterus is usually the seat of general fibroid hypertrophy and multiple interstitial or submucous growths. Under these circumstances hysterectomy must be the opera-

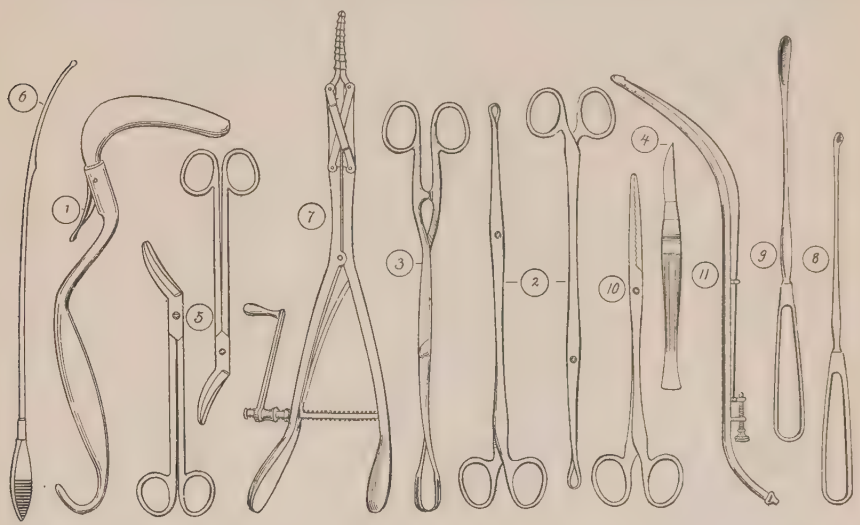


FIG. 422.—INSTRUMENTS USED IN THE OPERATION FOR THE REMOVAL OF A UTERINE POLYPUS (page 388).

tion of selection, as nothing is accomplished by removing only a portion of the diseased tissues. Besides, it must always be remembered, even when the operation is resorted to in an apparently favorable case, that a secondary operation (*hysterectomy*) may eventually be required because of the rapid development of small interstitial nodules which were not noticed at the time the original tumor was removed. Whenever myomectomy is decided upon the patient must therefore be informed of the increased dangers of the operation and the possibility of the occurrence of a secondary growth demanding surgical interference.

The technic of the operation is described on page 984.

Treatment of Fibroid Polypi.—The treatment of pedunculated fibromata growing from the uterine cavity or the cervical canal is surgical and consists in their removal by the vaginal route.

Technic of the Operation.—The Preparation of the Patient and the Preparations for the Operation are described on pages 830 and 831.

Position of the Patient.—Dorsal position.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Instruments.—(1) Simon's speculum (curved blade); (2) two bullet forceps; (3) volsella forceps; (4) scalpel; (5) right and left Emmet's slightly curved scissors; (6) uterine sound; (7) heavy uterine dilator; (8) Sims's sharp curet; (9) Martin's curet; (10) dressing forceps; (11) dilating uterine douche (Fig. 422).

Operation.—The operation is divided into two steps, as follows: First, the removal of the polypus, and, second, curetment of the uterine cavity in order to cure the coexisting endometritis and promote the involution of the uterus.

Simon's speculum is introduced into the vagina and the anterior and posterior lips of the cervix seized with bullet forceps to control and steady the parts.

If the polypus hangs in the vagina or appears at the external os uteri, it is seized with volsella forceps and severed from its pedicle with curved scissors. When the growth is situated above the internal os, the cervix must either be dilated with the heavy dilators or a bilateral incision made with a scalpel up to the vaginal junction. Usually the upper part of the cervical canal is found to be enlarged, but if this is not the case, it must be dilated with the heavy dilators before the tumor can be reached. As soon as the polypus is exposed to view it is seized with the volsella forceps and its pedicle severed with curved scissors. If the pedicle cannot be seen when traction is made upon the tumor, it should be located by introducing the index-finger into the uterine canal and the scissors guided by the sense of touch.

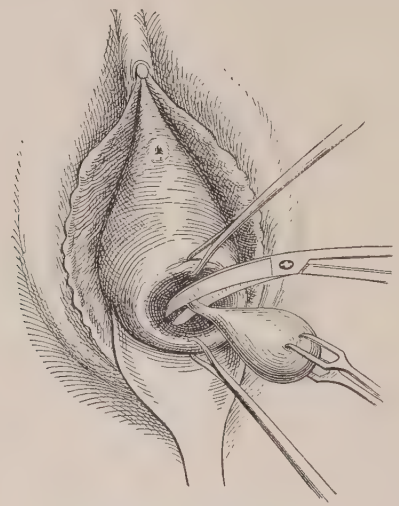


FIG. 423.—OPERATION FOR THE REMOVAL OF A PEDUNCULATED FIBROID POLYPUS OF THE UTERUS HANGING IN THE VAGINA.

If a large polypus completely blocks the vaginal canal and it is impossible to locate the pedicle, the tumor should be seized with volsella forceps and reduced in size by cutting away small pieces with curved scissors. The index-finger is then introduced into the vagina and the pedicle located and divided close to the polypus. The pedicle is then examined, and if necessary the redundant portion cut away with scissors.

After the polypus has been removed the uterine cavity is cureted (see p. 955) and the vagina and uterus irrigated with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution. The parts are then dried with

sponges and the uterine cavity and cervix packed with a strip of iodoform gauze. The vulva is then protected with a gauze compress and T-bandage.

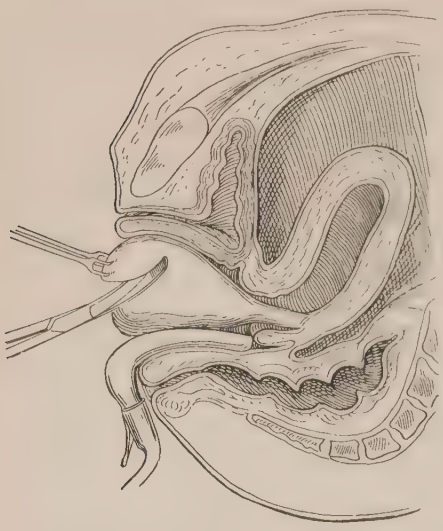


Fig. 424.

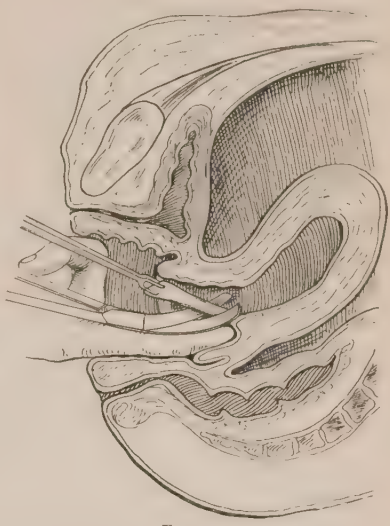


Fig. 425.

Operation for the Removal of a Large Fibroid Polypus of the Uterus Filling the Vagina. Fig. 424 shows the tumor being morcellated; Fig. 425 shows the pedicle being cut away.

Special Directions.—It must always be borne in mind that a uterine polypus may cause an inversion of the uterus, and consequently before severing the pedicle a careful vagino-abdominal examination must be made to exclude this condition (Fig. 426).

The hemorrhage is seldom profuse after the removal of a polypus, as its blood-supply is generally limited and the bleeding points are checked by the retraction of the tissues at the seat of operation. If, however, the bleeding is excessive, it is readily controlled by the intrauterine irrigations and the iodoform gauze packing which are employed in the operative technic.

A microscopic examination of the polypus and the curet scrapings from the uterine cavity should always be made; otherwise a malignant degeneration may be overlooked and the opportunity of performing an early hysterectomy lost.

After-treatment.—*Care of the Wound.*—The iodoform gauze packing is taken out in twenty-four hours and not reintroduced and the vagina irrigated daily with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution. The irrigations are kept up until the patient gets out of bed and then a daily douche of a gallon of hot normal salt solution is given for several weeks.

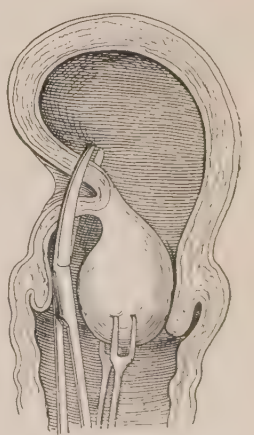


Fig. 426.—Operation for the Removal of a Fibroid Polypus of the Uterus.

Showing the danger of wounding the uterus when a partial inversion occurs from traction upon the tumor.

The *care of the bladder* and *bowels;* the *regulation of the diet;* and the *relief*

of restlessness and *pain* are discussed under the after-treatment of dilatation and curetment of the uterus on page 960.

Getting Out of Bed.—The patient should remain in bed one week.

Treatment of Fibroid Enlargement of the Intravaginal Cervix.—The indication in these cases is amputation of the cervix, and the technic of the operation is described on page 459.

Treatment of Fibroid Tumors Complicating Pregnancy.—One of the most difficult problems with which we have to deal is the question of treatment in cases of uterine fibroid complicated by pregnancy. It is naturally impossible to formulate fixed rules under these circumstances, and all that can be done is to point out the dangers and accidents that are liable to result, leaving the management of the individual case to the experience and skill of the surgeon.

Abortion is not only a frequent accident, but it is also a grave complication, as hemorrhage or sepsis is likely to occur. These dangers are greatly increased after the end of the third month, as the abortion is often incomplete, and, owing to the changed condition in the shape and direction of the uterine canal, it may be impossible to remove the retained placenta and membranes. Pelvic incarceration of the uterus may occur during the early months of gestation when the neoplasm occupies the lower uterine segment or when the growth is situated higher up, but becomes caught and fixed below the promontory of the sacrum. An interstitial tumor may become edematous, undergo softening, and give rise to painful and serious pressure symptoms. Tumors occupying the lower uterine segment, and particularly those which arise from the supravaginal cervix, cause severe pain from pressure, which increases in severity as the uterus develops in size. Finally, fibroid tumors may act as a mechanic obstruction to the passage of the child or they may so interfere with the natural processes that labor is greatly prolonged and the patient's life endangered from exhaustion, sepsis, or hemorrhage.

The expectant plan of treatment should never be advised except in exceptional cases. Thus, for example, we may hope for the continuance of pregnancy and the successful delivery of the child in a case in which there is a pedunculated subperitoneal tumor or small subserous nodules without general fibroid involvement of the uterine walls. Again, a fibroid tumor involving only the intravaginal portion of the cervix may be removed by amputating the neck of the uterus without disturbing gestation, and a polypus which is attached to the lower part of the uterine cavity or the cervical canal may be removed during pregnancy or at the time of labor if it is not discovered until then. With these exceptions delay in resorting to surgical interference is not justifiable, as the life of the mother is not only in constant danger during gestation, but it is also in great jeopardy during and after parturition. General fibroid involvement of the uterus, and tumors occupying the lower uterine segment, which include those arising from the supravaginal cervix, demand hysterectomy at once. Myomectomy should never be performed upon a gravid uterus, as the dangers of operative hemorrhage and sepsis are enormously increased. The induction of abortion or premature labor is never justifiable, for the reasons given above, and the latter operation should therefore not be considered in the interest of the child, whose chances of life are greatly increased by cesarean section. When a patient comes under observation for the first time at or near the period of fetal viability and no serious symptoms are present, the case should be carefully watched, and cesarean section, followed immediately by a supravaginal hysterectomy, performed about the middle of the eighth month.

CANCER OF THE BODY OF THE UTERUS.

Causes.—The disease is far less frequent than cancer of the cervix. It is, however, by no means rare, and recent investigations have shown it to occur more often than was formerly supposed. It occurs later in life than cancer of the cervix and the majority of cases are seen between fifty and sixty years of age. Although the disease is one of advancing years, yet it has been occasionally observed early in life. Cullen has reported three cases occurring in women thirty years old, and in my own practice abdominal hysterectomy was performed upon a young unmarried woman of twenty for adenocarcinoma of the body of the uterus. The microscopic findings in this case left no room for doubt as to the nature of the neoplasm. The disease attacks women who have borne children and those who are sterile with about equal frequency. Unlike cancer of the cervix, therefore, traumatisms of labor are not predisposing causes of the disease. The true cause of cancer of the body of the uterus is unknown, but the irritation of the endometrium and the loss of its power of resistance caused by chronic endometritis and fibroid tumors are supposed to act as predisposing factors. The question of race does not seem to enter into the etiology of the affection, as it occurs with equal frequency among white and colored women.

Pathology.—Cancer of the body of the uterus presents itself in the form of an adenocarcinoma. The disease may occur as a circumscribed outgrowth from any part of the uterine cavity or it may involve the entire endometrium from the start. In either case the outgrowth consists at first of small delicate papillas growing from the mucous membrane which gradually increase in size and eventually become fungoid in character, having a large or a small base; in the latter case the mass has the shape of a polypus. These fungoid masses, continuing to grow, finally occupy the whole of the uterine cavity, when they eventually break down or slough, leaving a foul, ulcerating surface which eats away the uterine walls and forms a crater-like cavity. The cancerous outgrowths are soft and friable and bleed readily upon the slightest touch. In certain cases, however, owing to "an excess of connective tissue," they are hard and do not have the physical characteristics of malignancy. As the disease advances the uterine walls become infiltrated and nodules appear under the peritoneum, which are yellowish-white in color and soft in consistency.

As a rule, the progress of the disease is much slower than cancer of the cervix and a longer time elapses before the affection becomes inoperable from a radical standpoint. The occurrence of secondary carcinoma of the body by metastasis is rare. It occurs more frequently, however, by continuity, when the disease starts in one of the adjacent organs and adhesions form with the uterus.

Extension.—The disease may extend by continuity to adjacent organs or by metastasis to more remote structures.

Metastasis is more frequent than when the disease begins in the cervix, and the involvement of distant organs is not uncommon, especially in the later stages of the disease, when the lymphatic glands become involved. Metastatic nodules have been observed in the pleura, the lungs, the liver, the peritoneum, the omentum, and in the lymphatic glands of the neck. Secondary infection by metastasis is frequent in the vagina and also in the ovaries and oviducts. Involvement of the lymphatic glands is a very late manifestation of the disease, and when it has taken place the case is beyond radical operative relief. Enlargement of the glands from an increase in their connective-tissue elements is, however, frequently observed, and must not be mistaken for a malignant infiltration. This has been demonstrated by Blood-

good and Cone from their study of enlarged axillary glands in cancer of the breast, and the importance, therefore, of this fact cannot be overestimated from an operative standpoint, as it is impossible to determine the true nature of the glandular hypertrophy without the aid of the microscope.

The disease may extend by continuity to adjacent organs, especially when they become adherent to the uterus. Thus, the intestines, the peritoneum, the omentum, the bladder, the rectum, and other structures may become involved, and subsequently a perforation may take place and a false passage result.

Symptoms.—The symptoms may be classified under the following headings:

Hemorrhage.	Pain.
Discharge.	General symptoms.

Hemorrhage.—This is the first suspicious symptom noticed by the patient. It usually manifests itself in the beginning as a show of blood following coitus, straining at stool, walking, or some form of active exercise, such as lifting heavy objects, etc. Sometimes the vaginal secretions may be streaked with blood or the linen may be slightly stained. As the disease progresses the menstrual flow becomes profuse and irregular hemorrhages occur between the periods. These increase in amount and duration, until finally in the later stages of the disease the bleeding is more or less continuous. If the patient has passed the menopause, the hemorrhages often occur with enough regularity for them to be mistaken for a return of menstruation.

In some cases the only evidence of hemorrhage is an increase in the duration and quantity of the menstrual flow, and the presence of the malignant disease is not even suspected until the cause of the menorrhagia is investigated.

Discharge.—Leukorrhea is an early symptom, occurring usually before the appearance of hemorrhage, although, as a rule, it is not noticed by the patient until later, as a slight increase in the amount of a pre-existing vaginal discharge would not be apparent.

In the beginning the discharge may manifest itself as a simple leukorrhea streaked with blood without any other abnormal characteristics, or it may be thin, watery, and profuse from the start, having a disagreeable odor and causing more or less irritation of the external genital organs. As the disease progresses it becomes profuse and purulent in character. The odor becomes foul and disgusting; the color changes to a dirty brown, from the presence of broken-down blood; and the secretions are mixed with shreds of decomposing cancerous tissue. Sometimes the discharge continues to be serous in character and without odor during the entire course of the disease.

Pain.—In the early stages of the disease pain is usually not a marked symptom, and in some cases it may be absent even when the cancerous degeneration is well advanced. In the beginning the pain is not, as a rule, acute, but later on, as the disease progresses and neighboring structures become involved, it frequently causes intense suffering. It is felt in the lumbosacral region, in the lower abdomen and pelvis, in the legs and thighs, and sometimes along the crest of the ilium. It may be constant or intermittent, and is described as shooting, burning, or colicky in character, or it may manifest itself as a dull heavy ache in the lumbosacral region and pelvic cavity. Severe paroxysms of uterine colic are frequent during the later stages of the disease. They are caused by the local irritation of the cancerous outgrowths and the distention of the uterine cavity with loose necrotic tissue and retained secretions. Pyometra is not nearly so common in cancer of the body of the uterus as when the disease begins in the cervix, and

consequently a permanent purulent accumulation seldom occurs, although there may be a temporary blocking up of the cervical canal with a fragment of cancerous tissue. Sometimes the paroxysms of pain are due to neuritis, which is a frequent complication and causes intense suffering. When the disease extends to the peritoneum and to the adjacent structures, the pain becomes more severe and symptoms of localized peritonitis may develop.

General Symptoms.—The general symptoms are discussed under cancer of the cervix on page 399.

Diagnosis.—An early diagnosis must be made of cancer of the body of the uterus if permanent results are to be expected from radical treatment. Without repeating what is said elsewhere upon the subject in discussing the necessity of an early recognition of cancer of the cervix, I feel that it will not be out of place to again insist upon the urgent need for a thorough investigation of the cause of all irregular hemorrhages from the uterus. The situation of the disease, the similarity of its clinical manifestations with other pathologic conditions of the uterus, and the insidious nature of its early symptoms combine to mask the true character of the affection unless a close and properly conducted study is made of every case by the attending physician or a specialist.

The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.
The microscopic examination.

The History.—There is very little in the history of the patient that points to the nature of the disease beyond a knowledge of her age. As has already been stated, cancer of the body of the uterus is a disease of advancing years, and with few exceptions it occurs at or after the menopause. Unlike cancer of the cervix it attacks nulliparæ and multiparæ with equal frequency, and consequently the traumatisms of labor cannot be considered as predisposing causes.

The Symptoms.—The characteristic symptoms are *hemorrhage*, *discharge*, and *pain*. Unfortunately, however, they do not become marked until late in the course of the disease, and consequently cannot be depended upon in making an early diagnosis. Hemorrhage is the earliest symptom that directs our attention to the uterus, and it may manifest itself as a menorrhagia or a metrorrhagia, or it may appear as a show of blood upon the linen or in the vaginal discharges. The leukorrheal discharge is seldom of sufficient importance to claim the patient's attention and passes unnoticed until its character changes or it becomes irritating to the external organs. A profuse, thin, watery discharge should always be investigated even if it is without odor and does not cause irritation.

The Physical Signs.—The physical signs are studied by (*a*) touch, (*b*) sight, (*c*) smell.

Touch.—The patient is placed in the dorsal position and the examination made by vaginal touch combined with recto-abdominal and vagino-abdominal palpation. The cervix and vagina are first examined and then the body of the uterus, and finally the pelvic organs are carefully palpated by the combined methods.

The cervix is softened and its canal is patulous or easily dilated by the examining finger. The uterus is symmetrically enlarged in the early stages, but later on its external surface becomes irregular or nodulated from cancerous deposits developing beneath the peritoneum. The body of the uterus is softer than normal and often somewhat tender upon pressure. The uterus at first is movable,

but as the disease extends adhesions take place with neighboring structures and it eventually becomes fixed in the pelvis. The existence of an old inflammatory lesion must not be lost sight of as a possible cause of fixation; this condition is fully discussed under cancer of the cervix (see p. 405). If the vagina is the seat of metastatic nodules, they can easily be detected by the examining finger. It is impossible to recognize a secondary involvement of the ovaries and oviducts with any degree of certainty, as the organs may be enlarged from other causes.

Sight.—The speculum gives but little or no information unless the vaginal surface of the cervix or the walls of the vagina are involved.

Smell.—As a rule, the discharges are without odor in the early stages of the disease, but later on the fetid, foul, and disgusting character of the secretions is more or less pathognomonic.

The Microscopic Examination.—The diagnosis must always depend upon the microscopic findings. This is absolutely true in the early stages of the disease and practically so at all times, as the degenerative changes take place within the cavity of the uterus, and are therefore hidden from observation. Furthermore, the characteristic symptoms of cancer of the body of the uterus are in no sense pathognomonic, as other uterine lesions produce similar subjective and objective signs.

Whenever irregular hemorrhages occur or the menstrual flow is increased in quantity or duration the cause must be determined without delay, and unless an absolutely satisfactory explanation for the symptoms can be found outside of the uterus its cavity must be cureted and the scrapings examined by the microscope (see p. 38). If the examination gives negative results, the patient must be kept under close and intelligent observation until all danger of malignancy is past. If the suspicious symptoms recur, the uterine cavity should again be cureted and the scrapings examined.

Special Directions.—It is not always necessary to use the dilators, as the cervical canal is often sufficiently dilated in cancer of the body to use the curet without first stretching the parts. It must always be borne in mind that the lesion is frequently limited to a circumscribed area in the beginning, and that unless the entire endometrium is removed by the curet the diseased portion may not be included in the findings, and consequently the scrapings submitted for examination may consist only of normal mucous membrane.

Whenever the cervix is soft and dilatable, the index-finger should be introduced into the uterus before the endometrium is cureted and its cavity carefully explored by touch. If the dilatation is not sufficiently great to admit the finger, a uterine sound should be substituted. These methods of examination often result in obtaining valuable information from a diagnostic standpoint by locating the causes of menorrhagia in cases that are not due to malignancy but to such lesions as uterine polypi and submucous fibroid tumors.

Differential Diagnosis.—Cancer of the body of the uterus may be mistaken for the following lesions:

Uterine polypi;
Submucous and other varieties of uterine fibromata;
Retained placenta;
Chronic endometritis;
Sarcoma.

All of these pathologic conditions present a partial or complete clinical picture of cancer of the uterus, and consequently a differential diagnosis that is based upon the history and the symptoms alone would often lead us far astray and in many cases result in a malignant degeneration being overlooked. I shall, therefore, not discuss the variations in the history and symptoms between these conditions and uterine cancer, as it would be misleading, for the reason that we would be dealing in unnecessary probabilities when we possess a positive method of making the differential diagnosis.

Hemorrhage or a discharge is the symptom which calls our attention to the uterus, and the cause must at once be determined by dilating the cervical canal, exploring the uterine cavity, and submitting the findings to a microscopic examination. There is no other rational method of procedure in these cases, as the lesion is hidden from view within the uterine cavity and its physical characteristics cannot be seen and studied.

Recognition of the Involvement of the Periuterine Tissues.—The patient is anesthetized and placed in the dorsal position. The cervix is then seized with bullet forceps and traction made in the direction of the vulvar orifice to test the mobility of the uterus, which is an important guide in determining the question of pelvic involvement. If the uterus is freely movable, there is in all probability no extension of the disease; but if it is fixed and cannot be pulled down, we should assume that the cancerous infiltration has invaded the periuterine tissues unless the adhesions are caused by an old inflammatory lesion.

The mobility of the uterus should also be tested by recto-abdominal and vagino-abdominal palpation, and the same forms of touch should also be employed to examine all the pelvic structures for the presence of nodular masses and areas of infiltration.

It is often difficult to distinguish between an inflammatory lesion of the appendages and cancerous involvement of the periuterine tissues, as they are both situated high in the pelvis. Later on, however, as the malignant disease advances the lower portion of the broad ligaments becomes invaded and feels like parchment stretched across the pelvis. Furthermore, the enlargement and thickening due to an inflammatory lesion lack the hard and nodular feel that is characteristic of malignancy.

Prognosis.—Death invariably results unless the disease is cured by a radical operation. The progress of the disease is much slower than in cancer of the cervix, and it may exist for several months or even one or two years before the malignant degeneration reaches an advanced stage. Although the average duration of the disease is not known, it is, however, very much longer than cancer of the cervix.

The operative prognosis is very good when the disease is limited to the uterus. Hysterectomy, under these conditions, results in from 60 to 75 per cent. of permanent cures, which is in marked contrast to the prognosis in cancer of the cervix.

Causes of Death.—The causes of death are discussed under cancer of the cervix on page 400.

Treatment.—The treatment of cancer of the body of the uterus is divided into:

The radical treatment.
The palliative treatment.

Radical Treatment.—Complete abdominal hysterectomy (see p. 696) is the operation of selection, and the general indications for the procedure are the same as those given for the radical cure of cancer of the cervix on page 407. *Vaginal hysterectomy is contraindicated.*

Palliative Treatment.—The palliative treatment is discussed under cancer of the cervix on page 408.

CANCER OF THE CERVIX.

Causes.—Cancer of the cervix is a very frequent affection and nearly one-third of all cases of primary carcinomata occur in the uterus. The disease attacks almost exclusively women who have borne several children; it has been observed, however, occasionally in nulliparæ. Traumatisms of labor are probably the most important predisposing influences in the production of the disease. This is shown by the frequency of childbirth in women who suffer from cervical cancer, and also by the fact that in the cases met in the nulliparous several gave a history of operative dilatation of the cervix or an injury from the spontaneous expulsion of a uterine fibroid polypus.

Cervical cancer is most frequently observed between thirty and sixty years of age; the largest number of cases occurring immediately before, during, or after the menopause. The disease is seldom met early in life, although cases have been observed before twenty years of age. Cancer of the cervix is uncommon in women over seventy years of age. The disease is more frequent in the lower classes than in the higher walks of life. Cullen has shown that cervical cancer is as frequent in colored women as in white, and the old theory, therefore, that the African race enjoys a comparative immunity is erroneous.

Pathology.—Cancer of the cervix occurs in two varieties:

Squamous-cell carcinoma.
Adenocarcinoma.

Squamous-cell Carcinoma.—This is the most frequent variety and the disease starts primarily from the squamous epithelium covering the mucous membrane of the vaginal portion of the cervix. In the beginning the cervix is somewhat hypertrophied, hard and nodular in character. The mucosa is paler than normal, but its surface shows no signs of erosion. Later on several groups of small delicate papillas are observed springing from the surface of the cervix which are very friable and bleed upon the slightest touch. These papillary or cauliflower growths may remain for some time as small wart-like vegetations or they may grow rapidly and eventually occupy the entire vaginal vault, completely hiding the cervix. After the cauliflower mass has attained a large size it begins to break down or slough, and finally it disappears altogether, leaving a deep irregular ulcer on the cervix. Usually at this stage of the disease the cervical tissues are more or less destroyed by the malignant ulceration and it is not uncommon to find that one or both of the lips of the cervix have entirely disappeared. As the disease advances the cervix is completely destroyed and the dome of the vagina is occupied by a deep crater-like cavity. The edges of this excavation are irregular and indurated and its sides are covered with shreds or small masses of gangrenous tissue. The cancerous tissues are very friable and a severe hemorrhage frequently follows even a careful examination of the parts. Gradually or rapidly the vagina becomes invaded and the disease finally extends to more distant structures. Sometimes the cancerous infiltration occludes the cervical canal and the uterine cavity becomes distended and filled with pus (*pyometra*).

Adenocarcinoma.—This variety starts primarily in the cervical canal. It develops either from the cylindric epithelium covering the mucosa of the canal or from the glands of the cervix.

The disease starts insidiously when the cervical mucous membrane is not exposed by a deep bilateral laceration of the cervix, and there may be an extensive involvement before any pathologic changes appear at the external os. This is especially the case when carcinoma begins in the upper part of the canal, and it is not uncommon to have the cervical tissues completely shelled out before the mucous membrane of the vaginal surface of the cervix is destroyed. When, however, the disease starts in the lower part of the cervical canal the external aspect of the cervix immediately surrounding the external os is quickly involved.

Adenocarcinoma of the cervix develops slowly and the nodular masses of infiltration do not usually break down and ulcerate until late in the course of the disease. In some cases the entire cervix may be completely involved and the disease extended laterally before there is the slightest evidence of any destructive change taking place. Before ulceration occurs the cervix is hypertrophied, hard, and nodular, and the mucous membrane is paler than normal; but after the tissues break down the general characteristics of the ulceration are the same as in squamous-cell carcinoma. In rare instances a cancerous growth springing from the cervical canal may present itself as a cauliflower-like mass protruding from the external os.

Pyometra may occur in cases of adenocarcinoma and is due to the same causes as when the complication is associated with a squamous-cell cancer of the cervix.

When the cylindric epithelium of the cervical canal extends abnormally down beyond the external os, as it sometimes does as a congenital condition, an adenocarcinoma may develop upon the vaginal surface of the cervix.

Extension.—The disease may extend by infiltration into the adjacent structures or by metastasis to more distant parts of the body. As a rule, cancer of the cervix remains as a local condition and does not extend to distant organs by metastasis. In rare instances, however, metastatic involvement has been observed during the last stages of the disease in the lungs, the liver, the stomach, and other organs.

Body of the Uterus.—The body of the uterus always becomes invaded as the disease progresses. The involvement occurs earlier in adenocarcinoma than in the squamous-cell variety. According to most authorities, there is an interstitial or glandular endometritis present in the early stages of cervical carcinoma. Cullen, however, holds that there are no abnormal changes in the endometrium unless the cervical canal becomes occluded by extensive infiltration. Under these circumstances the uterine secretions are retained and eventually *pyometra* or *physometra* develops. In the beginning the mobility of the uterus is not impaired, but as the disease extends and attacks the periuterine structures it becomes fixed and immovable along with other pelvic structures.

Vagina.—The vagina is usually involved sooner or later in the course of the disease. The extension occurs earlier in squamous-cell carcinoma than when the growth develops in the cervical canal. Usually the cancerous infiltration is limited to the upper part of the vagina, but in some cases the disease may involve the entire canal.

Bladder.—Involvement of the bladder is a frequent complication and it occurs early when the disease starts in the anterior portion of the cervix. The organ is more often invaded in squamous-cell carcinoma than in adenocarcinoma, and in the latter variety fistulous openings into the vagina do not, as a rule, occur until late in the course of the disease. Owing to the anatomic relations existing between the bladder and the uterus it is not uncommon to find the external coat

of the former organ involved early in the disease and to observe cancerous nodules near the trigonum vesicæ. These foci of carcinomatous degeneration eventually ulcerate and form false passages between the bladder and the vagina. The unaffected portions of the mucous membrane become inflamed and give rise to symptoms of cystitis. The capacity of the bladder also becomes lessened, until finally the organ is almost obliterated by the contraction and infiltration of the tissues. In advanced cases after fistulous openings are formed the interior of the bladder and the sides of the fistulas are covered with pus, gangrenous material, and foul discharges.

Rectum.—Owing to the position of the rectum it is less often involved than the bladder, and when the invasion does occur it usually takes place late in the disease. In the majority of instances the patient dies before the ulcerative changes have progressed far enough to form fistulous openings into the rectum, and for this reason these false passages are comparatively rare. When they are present, however, they differ in no way from the fistulous openings into the bladder. The rectum is usually not involved directly by an extension of the disease from the uterus, but indirectly from the vagina, except where the pelvic organs have become adherent as the result of a pre-existing inflammation. A tight stricture of the rectum seldom results from secondary involvement from the uterus or vagina, and in this respect the disease differs from primary cancer of the bowel. During the final stages of the disease inflammation of the colon is a frequent complication.

Kidneys; Ureters.—Suppuration of the kidneys may result from infection of the ureters either as the result of direct extension from a septic bladder or from cancerous involvement followed by ulceration. Again, hydronephrosis and chronic inflammation of the kidneys may be produced by obstruction of the ureters. This usually occurs from direct pressure when the cancerous infiltration is situated in the broad ligaments or from the invasion of the ureters themselves by the disease. Sometimes the orifices of the ureters may become obliterated when the cancerous process affects the walls of the bladder or the canal may be so distorted by a coexisting non-malignant pelvic inflammation that the urine is unable to escape. Ulceration of the ureter may be followed by the formation of a ureterovaginal fistula, which is, however, a comparatively rare complication.

Urethra.—Involvement of the urethra is very rare.

Pelvic Connective Tissues.—The pelvic connective tissues become involved by extension of the disease from the body of the uterus, the cervix, or the vaginal culdesac. When this occurs, the broad ligaments become thickened and lose their elasticity; the uterus becomes immovable; and the pelvic structures are firmly united and fixed. The infiltration eventually compresses the pelvic blood-vessels and nerves, which causes the edema and pain that are common symptoms late in the course of the disease.

Lymphatic Glands.—The pelvic, retroperitoneal, and inguinal glands usually become involved after the periuterine tissues have been invaded, and consequently the case has then progressed so far that a radical operation is out of the question.

Pelvic Bones.—The pelvic bones are only involved in very rare instances, as death generally takes place before sufficient time has elapsed for secondary extension to occur.

Peritoneum.—A direct opening into the peritoneal cavity from an extension of the ulceration is a very rare complication. This is due to the fact that the peritoneum resists the ulcerative process by causing adhesions to form around the infiltration as the disease advances.

Symptoms.—The symptoms may be classified under the following headings:

Hemorrhage.	Pain.
Discharge.	General symptoms.

Hemorrhage.—As a rule, the first symptom is a slight show of blood. This usually follows some form of physical exertion, such as coitus, straining at stool, or walking. The bleeding is usually very small in amount and simply stains the linen or streaks the vaginal discharges with blood. Sometimes the hemorrhage shows itself as a menorrhagia or there may be a loss of blood between the periods. Again, menstruation may become more frequent or more profuse at the time of the menopause, or a more or less periodic flow may occur several months or years after the change of life. The bleeding in the beginning of the disease is not due to ulceration, but is caused by the chronic uterine congestion and endometritis which are produced by the neoplasm, and to the rupture of the vessels contained in the small papillas which grow from the surface of the cervix.

As the disease advances and the ulcerative process begins the hemorrhage becomes more and more constant and profuse, until eventually there is a continuous loss of blood along with the leukorrheal discharge. Sometimes the walls of an artery may be ulcerated through and a sudden and severe hemorrhage results that may place the life of the patient in danger. As a rule, however, death is seldom caused by a sudden hemorrhage.

Discharge.—Leukorrhea is an early symptom of the disease. It usually begins at the same time as the first appearance of the bleeding, but in some cases it may precede or follow it. The discharge is at first serous or watery in character, without odor, frequently streaked with blood, and often very profuse. After ulceration begins it becomes mucopurulent and mixed with blood and fragments of necrotic tissue which impart an odor of decomposition that is very fetid and disgusting. As the disease progresses and the ulceration extends the discharges become more and more profuse and irritating, and finally cause excoriations on the inner surfaces of the thighs and a distressing pruritus vulvæ.

Pain.—Pain is not present, as a rule, in the beginning of the disease, and so long as the cancerous growth is limited to the intravaginal cervix but little or no inconvenience is experienced by the patient. But when the growth invades the uterus and the pelvic connective tissues, the nerves are either pressed upon or their structure affected by the disease, and pain becomes a marked symptom that gradually wears the patient out from loss of sleep and acute suffering. Pain is, therefore, usually a late symptom, and does not manifest itself, as a rule, until the case is well advanced; sometimes it may be absent during the entire course of the disease. Pain is generally felt in the lumbosacral region, in the pelvic cavity, in the lower abdomen, or it may radiate down the sciatic nerves, and as the disease extends it may be referred to the perineum, the rectum, the bladder, the ureters, the kidneys, or the peritoneum. It may be constant or occur only at intervals, and is described as lancinating, gnawing, burning, or shooting in character. In some cases the pain is not acute and the patient suffers from a dull constant ache in the lumbosacral region. Sometimes the cervical canal is constricted by the cancerous growth and uterine colic results from the effort of the uterus to expel the retained secretions; hematometra, pyometra, and hematosalpinx may occur in very exceptional cases in this way.

General Symptoms.—The general health usually remains good during the early stages of the disease, but later on the nutrition is impaired and the patient becomes cachectic and rapidly loses flesh and strength. Eventually uremia develops from obstruction of the ureters or kidney complications, and the patient becomes more and more apathetic as to her condition and surroundings.

The gastro-intestinal disturbances are characterized by loss of appetite, con-

stipation, nausea, and vomiting. While obstinate constipation is the rule, diarrhea may be present in some cases, and it is not at all uncommon to have the two conditions alternating with each other. Toward the end of the disease there is often difficult and painful defecation and not infrequently the patient passes large quantities of mucus from the inflamed and irritated colon. The nausea and vomiting are partly due to the uremic state and to the foul odor of the discharges which, along with the loss of appetite and constant thirst, tend to keep the stomach more or less unsettled and irritated. When the bladder becomes involved, there may be vesical irritability and painful urination due to the inflamed and altered condition of the mucous membrane, and not infrequently blood is present in the urine. Retention of urine is a rare complication. Urinary fistulas communicating with the uterus or the vagina are often caused by ulcerations which occur in the later stages of the disease. Symptoms of hydronephrosis and uremia manifest themselves when the ureters become obstructed and in some cases suppurative nephritis may develop. Peritonitis is a rare complication, as the peritoneum protects itself by forming adhesions as the ulcerative processes advance. Fistulous openings may occur in the ureters or in the rectum toward the end of the disease. Edema of the lower extremities is a late symptom and in some cases a *phlegmasia alba dolens* may develop. Ascites is frequently present and the superficial veins in the abdominal walls are often enlarged.

Causes of Death.—The majority of cases die from uremia and exhaustion. In rare instances death may be due to sudden hemorrhage, to pulmonary embolism, septicemia, or peritonitis. Cancerous patients frequently succumb to a trifling intercurrent disease.

Diagnosis.—The importance of an early diagnosis in cancer of the cervix cannot be overestimated, as every hope from a radical operation is based upon it. Unfortunately a large proportion of the cases seek the advice of the specialist too late for any hope of permanent operative relief, and all that can be done is to ameliorate the most distressing symptoms without the slightest chance of saving the patient's life. The failure in making an early diagnosis is due to the insidious nature of the onset of the disease and to the erroneous views held by the general practitioner and the patient upon the importance of investigating at once the cause of all irregular hemorrhages and bloody discharges coming from the vagina. Cancer of the cervix often occurs so insidiously that the disease is well advanced and the surrounding structures invaded before the fatal nature of the trouble is suspected and a physical examination is made. The tendency of women to belittle menstrual excesses and irregular hemorrhages from the uterus and their ignorance of these subjects are almost universal, and we cannot hope to combat the ravages of uterine cancer by a radical operation until they are taught to recognize the absolute necessity for seeking advice when there is the slightest show of blood at an irregular time or an excess at the normal periods. There is also a habit among some practitioners of attributing these irregularities to the change of life or to some acute condition such as congestion, and to tell the patient that "everything will come right in time." The examination is therefore put off or delayed while the patient gradually becomes worse, until eventually the urgency of the symptoms demands a physical investigation, when a crater-like cavity is discovered in the vaginal vault and the patient is brought post-haste to the specialist, only to be told that the time for permanent surgical relief has passed.

The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.
The microscopic examination.

The History.—While the diagnosis cannot be based upon the history of the patient, yet it will often lead us at least to suspect the possibility of malignancy. It is, therefore, important to know the age of the patient, the number of children she has had, her social condition, and such other particulars as may have a bearing upon the predisposing causes of cancer.

The Symptoms.—The characteristic symptoms of cancer of the cervix are *hemorrhage, discharge,* and *pain.* But these manifestations belong to the stage of the disease when ulcerative changes have taken place, and when the diagnosis is easily made by the physical signs. The early diagnosis depends upon a thorough physical and microscopic examination to determine the cause of all menstrual excesses and bloody discharges no matter how slight they may be in amount. Nature sounds the warning in the leukorrheal discharge streaked with blood, or in the few drops which appear after sexual intercourse or straining at stool, and if she is not heeded the patient is doomed. Sometimes in early cases the examination does not give positive results, and it may be necessary, therefore, to keep the patient under constant observation until all danger of malignancy is past.

Hemorrhage, either in the form of menorrhagia or a slight show of blood at irregular periods, is the earliest and most important symptom of cancer of the cervix. It usually begins long before ulceration has taken place, and is due, as has been said, to the endometritis which is usually associated with the disease or to rupture of the vessels in the papillas which grow from the cervix. In those cases which give no history of early bleeding the probabilities are that the symptom had been forgotten by the patient or that the amount of blood lost was so slight and the occurrence of the hemorrhage so infrequent in the beginning of the disease that it was entirely overlooked. While leukorrhea usually occurs very early in the course of the disease, its importance from a diagnostic point of view is practically worth nothing, as all women suffer more or less from some leukorrheal discharge and a slight increase in its amount would pass unnoticed. In exceptional cases a profuse watery discharge has been known to precede the development of cancer of the cervix. It is usually more or less irritating to the external organs of generation and generally causes a severe pruritus vulvæ. The appearance, therefore, of a discharge of this character demands an immediate examination of the uterus.

The Physical Signs.—The physical signs of cancer of the cervix are studied by: (*a*) touch, (*b*) sight, (*c*) smell.

Touch.—The patient is placed in the dorsal position. This method of examination gives the best conception of the character and extent of the pathologic changes. The manipulations should be carefully made, as a severe hemorrhage may result from roughness upon the part of the examiner. The investigation begins by employing vaginal touch, and after the cervix and vagina have been thoroughly examined recto-abdominal and vagino-abdominal palpation should be employed to determine the condition of the body of the uterus, the presence or absence of uterine distention (*pyometra*), the state of the periuterine tissues, and the mobility of the pelvic structures and organs.

Sight.—The patient is placed in the dorsal position. Inspection of the cervix through a speculum is seldom indicated except in the early stages of the

disease to observe the changes in the color of the mucous membrane, the appearance of small erosions, the characteristics of delicate papillary growths, and the condition of the external os in adenocarcinoma. In the later stages the use of the speculum is not only very painful to the patient and liable to start a severe hemorrhage, but it is entirely useless, as it does not add to the information obtained by touch.

Smell.—In the early stages the vaginal discharges are usually without odor, but after ulceration has begun their foul, fetid, disgusting, and nauseating character is so significant that a diagnosis by smell alone is possible in the vast majority of instances.

In the early stages the two varieties of cervical cancer differ in their physical characteristics, but after the breaking-down process begins there is no difference in the picture that they present. I shall therefore divide the physical signs into those which are present early in the disease and those which present themselves after ulceration begins.

Early Signs.—*Squamous-cell Carcinoma.*—In the beginning a careful examination will show that the cervix is slightly enlarged, and that the tissues are harder than normal and somewhat nodular in character. By looking through a speculum the mucous membrane of the cervix is found to be somewhat pale and its surface has a glazed appearance. The secretions may or may not be increased in amount and they are without odor, but they may be watery and thin in character. In this stage the physical signs are so slight and apparently so unimportant that the condition of the cervix would not arouse suspicion were it not for the symptom of irregular hemorrhages or bloody discharges. We must therefore rely upon the microscope in making the diagnosis, and it is at this period especially that such an examination means so much for the patient's chances of life after a radical operation. In a short time a more characteristic state of affairs intervenes and small delicate papillas are observed on the surface of the cervical mucous membrane which are very friable and bleed readily upon touch. These excrescences may grow slowly or rapidly, but in either case the vaginal vault is finally occupied by a large cauliflower mass. It is not long after this mass has attained some size that it begins to break down and undergo disintegration, leaving a deep irregular ulcer on the cervix. The further progress of the disease is now similar to that of adenocarcinoma after it has reached the ulcerative stage.

Adenocarcinoma.—In the beginning the cervix is hypertrophied, hard, and nodular, and the mucous membrane is paler than normal and has a glazed look. The physical signs at this period are, therefore, the same as in the squamous-cell variety and the diagnosis must likewise be made with the microscope. The disease is very insidious, it develops slowly, early bleeding is often absent, and extensive involvement is frequently present, not only in the cervical tissues but also in the surrounding parts, before there is any tendency to disintegration in the cancerous nodules. Again, when the disease begins in the upper part of the cervical cavity it is very late in manifesting itself at the external os, and the entire canal may be destroyed before the physical signs indicate the dangerous extent of the involvement. When the disease starts, however, near the external os it soon appears on the vaginal surface of the cervix. It should not be forgotten that in rare instances a cancerous cauliflower-like mass may grow from the cervical canal and protrude from the external os early in the disease. In rare cases the cylindric epithelium may extend abnormally downward beyond the external os and an adenocarcinoma may start from the vaginal surface of the cervix. When an adenocarcinoma of the cervix begins to break down its further progress is

identical with that of the squamous-cell variety after the latter reaches the ulcerative stage.

Ulcerative Stage.—As has been stated, the physical signs are similar in both varieties of cervical cancer during the ulcerative stage. The changes which occur in the pelvic organs and the result of the extension of the disease to adjacent structures are fully described under the pathology of squamous-cell carcinoma, and need not therefore be mentioned again.

The local conditions found upon vaginal touch are so characteristic that the nature of the disease cannot be mistaken by any one who has had even a small experience in these cases. The crater-like cavity or the puckered and indurated depression in the vault of the vagina, the character of the ulceration, the advancing ridges of cancerous infiltration, the friable nature of the tissues, the tendency to bleed upon the slightest touch, the masses of gangrenous material, and the foul discharge, mixed with blood, pus, and necrotic debris, point unmistakably to the malignant nature of the affection.

The Microscopic Examination.—When malignancy is suspected, a wedge-shaped piece of tissue should be removed from the cervix and sent to a pathologist for examination (see p. 39).

The success of a radical operation depends upon an early recognition of the disease, and the microscope should therefore be employed in every case where there is the slightest suspicion of cervical cancer. If the microscopic findings are negative, the patient must be kept under constant observation and the cervix examined by sight or touch every month or six weeks, noting carefully any increase in the induration or the appearance of outgrowths upon the mucous membrane. If the local conditions show the slightest unfavorable change, a piece of the cervical tissue must be excised and the microscope again employed. It not infrequently happens that the second examination gives positive results, and unless this fact is borne in mind the negative findings of the first examination may create a false sense of security in the mind of the surgeon which may be fatal to the patient.

A negative microscopic report does not by any means prove the absence of cancer, and in some instances it is justifiable to perform a radical operation upon the evidence presented by the clinical symptoms alone.

To guard against an error in diagnosis and to discover malignancy in cases operated upon for presumably innocent conditions it should be a routine practice to make a microscopic examination of the tissues removed in performing a trachelorrhaphy or an amputation of the cervix, as well as all scrapings from the uterine and cervical canals and growths extirpated from the surface or the interior of the uterus.

Differential Diagnosis.—The microscope must be relied upon in all doubtful cases, as it is often impossible to make the differential diagnosis from the clinical history and the physical signs.

The following lesions may be mistaken for cancer of the cervix:

Eversion of the intracervical mucous membrane.
Cystic degeneration.
Simple erosions or ulcerations.
Specific ulcerations (*chancre*, *chancroids*, and *tuberculosis*).
Scar tissue.
Hypertrophy.
Condyloma.
Sarcoma.
Uterine and cervical polypi.
Submucous uterine fibroma.

Eversion of the Intracervical Mucous Membrane.—This is a comparatively rare condition except in cases of laceration of the cervix. Eversion may occur in nulliparæ from other causes, and it may also result from a congenital defect in which the cervical mucous membrane extends beyond the external os. An eversion of the mucous membrane of the cervical canal is red in color; it feels granular to the touch; it does not bleed readily; it is not friable; it is without induration or hardness; and it is clearly defined from the mucosa of the vaginal surface of the cervix. A slight ordinary leukorrhea is the only subjective symptom complained of by the patient.

Cystic Degeneration.—The cysts are easily seen, they have a bluish or pearl-like color, and they contain a clear, whitish, tenacious fluid, which is the normal secretion of the cervical glands. They are readily evacuated with a bistoury; there is no tendency to bleed, and the tissues are not friable. When a large number of cysts are present, there may be some hardening and thickening of the cervix, but the characteristics of cancer are absent.

Simple Erosions or Ulcerations.—The ulceration is irregular in outline with sharply defined margins and there is an absence of the elevated and indurated condition of the edges observed in cancer. There is no destruction of tissue; the surrounding parts are not infiltrated; the ulceration does not bleed readily upon touch; and the granulations are not friable. The surface of the ulcer is covered with typical granulations, over which may be spread a small quantity of pus and broken-down tissue. The general appearance of the ulcer denotes a sluggish condition and lacks the active inflammatory characteristics of cancer.

Specific Ulcerations.—(*Chancre, Chancroids, and Tuberculosis.*)—Chancre.—The initial lesion of syphilis is rarely found on the cervix. In women who have borne children and the intracervical mucous membrane is exposed by a bilateral laceration the parts are more susceptible to infection and a chancre is more likely to occur. A chancre occurs as a single ulcer and presents the usual characteristic physical signs. The diagnosis is based upon the history of the case, the appearance of the secondary lesions, and the disappearance of the ulceration under appropriate treatment. Chancroids.—This is also a rare lesion on the cervix. The diagnosis is based upon the presence of several distinct ulcerations; the history of the case; and the disappearance of the lesions under appropriate local treatment. Tuberculosis.—The affection is usually associated with tubercular deposits in other parts of the body, especially the lungs, and it may also be secondary to an infection in another part of the genito-urinary tract. The ulceration is situated, as a rule, near the external os uteri, or it may completely encircle it, and the surface of the ulcer is eroded and covered with a purulent caseous secretion. The margins of the ulceration are clearly defined, soft to the touch, and not surrounded by induration, as in cancer. Miliary tubercles may be seen scattered over the adjacent surfaces and a microscopic or bacteriologic examination may reveal the presence of the tubercle bacillus.

Scar Tissue.—A plug of cicatricial tissue situated in the angle of laceration in tears of the cervix is not an uncommon occurrence and may be mistaken for the induration of cancer. Its nature, however, is readily determined by the evidence of a laceration; the situation of the scar tissue which is surrounded by normal mucous membrane; and the absence of induration in the adjacent structures. In doubtful cases the scar tissue should be excised and examined by the microscope.

Hypertrophy.—This condition may be due to subinvolution or fibroid changes and may be mistaken for the indurated stage in adenocarcinoma. In hypertrophy, however, the tissues are not so hard and there is an absence of

nodular formations. The enlargement of the cervix, as a rule, is greater and the mucous membrane is smooth and normal in appearance. There is no tendency to bleed upon examination, after coitus or straining at stool, but the menstrual flow may be somewhat excessive, especially when the uterus is also involved. In case of doubt the cervical canal should be dilated and its mucous lining examined by sight and touch and a piece of tissue excised for microscopic examination.

Condyloma.—This is a very rare affection, usually occurring during pregnancy, and generally associated with condylomata of the vulva. As a rule, all vegetations springing from the cervix are malignant in character, and a wedge-shaped piece of tissue should always be removed from the base of the growth and examined by the microscope. In squamous-cell carcinoma the base of the papillary outgrowth feels hard and indurated to the touch, but in the simple form of condyloma these characteristics of malignancy are absent.

Sarcoma.—The affection is less frequent than carcinoma and very little is known of the clinical picture that the disease presents in its early stages. The microscope must be employed in all cases to decide the diagnosis.

Uterine and Cervical Polypi.—A polypus growing from the uterine or the cervical canal may suggest cancer of the cervix or the uterus on account of the accompanying hemorrhage and discharge. Again, the suspicion of malignancy is greater when the polypus becomes gangrenous and sloughs, causing a foul, purulent discharge, which, together with the constant hemorrhage, rapidly exhausts the patient and produces anemia and cachexia. The method of making the diagnosis in these cases is to dilate the cervical and uterine cavities, find the polypus, remove it, and send the tumor to an expert pathologist for examination. The diagnosis should always depend upon the microscopic findings and not upon the physical characteristics of the growth, because it may present all the appearances of being innocent and yet be malignant in character.

In a case of fibroid polypus the cervix is normal, no induration or nodules are felt, and the external os is somewhat dilated. The uterus is enlarged, but its walls are not thickened or infiltrated. If the tumor is low down in the cervical canal it may be felt by the examining finger or seen through the speculum at the mouth of the cervix. Sometimes the polypus is expelled from the uterus and hangs in the vagina suspended by its pedicle.

Submucous Fibroma.—This variety of fibroma is rare in the cervix, but it is more or less frequent in the body of the uterus. The symptoms of hemorrhage and leukorrhea suggest the possibility of cancer. If the cervical mucous membrane covering the neoplasm becomes attenuated and sloughs, the foul offensive discharge increases the suspicion of malignancy. The diagnosis depends upon the microscopic findings. The cervix should be dilated and the growth removed and sent to a pathologist. It may sometimes be necessary to split the cervix to reach the tumor. When this is done, the edges of the wound should be brought together with catgut sutures.

Recognition of the Involvement of the Periuterine Tissues.—This is important from an operative standpoint because if there is decided involvement no form of radical operation will effect a permanent cure. The patient should be anesthetized and placed in the dorsal position. The cervix is then seized with bullet forceps and traction made in the direction of the vulvar orifice to test the mobility of the uterus, which is a valuable guide in determining the

question of pelvic involvement. Free mobility justifies the opinion that there is little or no invasion of the periuterine structures, whereas if the uterus cannot be pulled down, we should assume that the organ has become fixed as the result of malignant changes in the broad ligaments and other pelvic structures.

It must not be forgotten, however, that the uterus may have become adherent from an old pelvic inflammatory lesion and that the fixation of the organ may be due to this cause and not to cancerous infiltration. In a case of this kind we must consider the variety of the carcinoma and the stage of the disease. A squamous-cell carcinoma of the cervix does not, as a rule, involve the periuterine tissues until the disease is well advanced, whereas an adenocarcinoma may be associated with extensive lateral involvement before the cervical infiltration shows any tendency to break down. Consequently fixation of the uterus in a case of squamous-cell carcinoma that has not advanced sufficiently to eat away the entire cervix, leaving a crater-like cavity in the vaginal vault, is probably due to an old inflammatory lesion. On the other hand, if the case is one of adenocarcinoma in which the cervix is generally infiltrated but not broken down or ulcerating, the immobility of the uterus is more than likely due to an extension of the disease laterally into the broad ligaments.

The mobility of the uterus should be tested still further by recto-abdominal and vagino-abdominal palpation, and the same methods of touch should also be employed to examine all the pelvic structures for the presence of nodular masses and areas of infiltration. When the tissues are generally involved, the uterus and adjacent pelvic structures are firmly matted together and the broad ligaments feel like parchment stretched across the pelvis.

Again, the situation of an old inflammatory lesion is significant. The thickening is felt high in the pelvis and corresponds with the position of the tubes and ovaries, which are often found to be enlarged. A cancerous induration, on the other hand, is situated low down and is felt through the vaginal vault extending directly from the diseased cervix into the base of the broad ligaments. And, finally, the enlargement and thickening due to a simple lesion lack the hard, nodular, stony feel that is characteristic of malignancy.

Complicating Pregnancy.—Pregnancy occurring as a complication in cancer of the cervix, while not frequent, is still far from uncommon. The changes in the endometrium and the foul discharges are conditions which are unfavorable to conception. The ordinary symptoms of the disease are not, as a rule, affected by the complication, except that the hemorrhages are more profuse, owing to the greater vascularity of the uterus. The progress of the disease also becomes more rapid and the cancerous involvement shows a marked increase during the period of gestation and for several weeks after labor. The results, so far as pregnancy and labor are concerned, are very dangerous to both the mother and the child. Generally these patients abort before the placenta is fully formed, but if they go beyond this period, the child is usually carried to the end of gestation. According to Cullen, "the patient may pass term without delivery, as was demonstrated by Menzie's patient, who died seventeen months after conception; at autopsy the liquor amnii had disappeared, but the child, although somewhat compressed, showed no signs of maceration."

An abortion is especially dangerous and death is likely to result from septicemia or hemorrhage. If the case goes to full term, labor is seldom normal and the child is generally *still-born*. Extensive lacerations may occur involving the rectum and bladder or the diseased cervix may be completely torn from the lower segment of the uterus. When the infiltration is extensive and the cervix does not undergo dilatation, the uterus is likely to rupture and its contents escape into the abdominal cavity unless operative measures are instituted at once. Delivery of

the child through the natural passages is usually followed by fatal hemorrhage or septicemia.

Prognosis.—When the course of the disease is not interfered with by operative or palliative treatment, death invariably results in from one to two years, and in the majority of cases the fatal ending is reached in about eighteen months. The palliative treatment, by controlling the hemorrhage and the discharge, prolongs life for several months or even longer. *At the present time hysterectomy offers but slight hope of a lasting cure.* The vast majority of the cases operated upon have a local recurrence of the disease, and not more than 5 to 10 per cent. are permanently cured. Probably even this is too large a proportion of recoveries and we would be nearer the truth in estimating it at 5 per cent.

The operative prognosis in the future depends upon the early recognition of the disease, and the general practitioner, therefore, should consult a specialist so soon as there is the slightest suspicion of cancer and not wait until the time has passed for radical operative relief.

Treatment.—The treatment of cancer of the cervix is divided into:

The prophylactic.	The palliative.
The radical.	The use of the *x*-rays.

Complicating pregnancy.

The Prophylactic Treatment.—While nothing is known of the cause of cancer, yet it is a clinical fact that the disease occurs almost exclusively in women who have borne several children, and, consequently, so far as our present knowledge serves us, it is important that lacerations of the cervix should be viewed in the light of a dangerous predisposing cause. As a prophylactic measure, therefore, all such traumatisms should be repaired.

This is especially true of lacerations which are associated with eversion of the mucous membrane of the cervical canal, cystic degeneration, erosion, and hyperplasia of the tissues of the cervix. The obstetrician before discharging a patient after confinement should examine the cervix, and if a laceration is found to be present, it should be repaired within three or four months. It should also be the duty of the general practitioner to examine the cervix of all women who consult him for pelvic symptoms and urge a repair operation if a laceration is found. And, finally, I would urge, as a routine practice, the examination of every woman over forty years of age who has borne children and the immediate repair of all lacerations of the cervix that may be discovered.

The prophylactic treatment of cancer of the cervix, in my judgment, is most important, and I am convinced that the frequency of the disease could be materially lessened if the general practitioner would educate his patients to appreciate the necessity for repairing cervical tears.

The Radical Treatment.—The only permanent cure for cancer of the cervix is the complete extirpation of the uterus and the removal of a portion of the surrounding healthy tissue. It is only in the early stages when the disease is limited to the uterus that hysterectomy is indicated, and if the vagina, the rectum, the bladder, the broad ligaments, or the

cellular tissue of the pelvis is involved, a radical operation is useless.

If the disease has advanced beyond the uterine structures, it develops more rapidly, as a rule, after a hysterectomy than when palliative treatment is employed, and consequently the radical operation under these circumstances hastens the death of the patient.

The indications for a radical operation should be carefully studied in each case. In the last stages of the disease little or no difficulty should be experienced, as the extension of infiltration and the ulcerative changes in adjacent structures are clearly evident. Early in the course of the affection, however, it is often difficult to determine whether or not the periuterine tissues are involved, and a careful examination under an anesthetic should therefore be made in the manner described above. As has already been stated, the bladder may become infiltrated early, and consequently a cystoscopic examination should be made when symptoms of vesical irritation are present.

Complete abdominal hysterectomy (see p. 996) is the operation of selection in all cases of cancer of the cervix demanding a radical method of treatment. Vaginal hysterectomy is a less radical operation, as the extirpation cannot always be carried far enough into the surrounding tissues to completely eradicate the disease, and consequently a permanent cure will not be so likely to result.

The Palliative Treatment.—The palliative treatment is purely symptomatic and lessens the hemorrhages and foul discharges; temporarily checks the progress of the disease; prolongs the patient's life; and renders her condition more endurable. It is indicated when the disease has extended beyond the uterine structures.

The chief symptoms which present themselves for treatment are:

Discharge; Hemorrhage.
Pain.
Constipation.
Exhaustion.
Dribbling of urine; Escape of feces.

Discharge; Hemorrhage.—These symptoms are controlled by the operation of *Curetment and Cauterization*, which should be the first step in the palliative treatment.

It may be necessary to repeat the operation several times during the course of the disease on account of an increase in the amount of the discharge and hemorrhage. Under these circumstances an examination demonstrates the presence of masses of friable tissue which have developed since the previous curetment and which must be removed and the surface cauterized before the symptoms are relieved again.

Technic of the Operation.—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 830 and 831.

The usual method of sterilizing the vagina at the time of operation (see p. 831) cannot be employed if the ulceration is extensive, as a false passage might readily be made into the bladder or rectum and add to the complications of the case. The parts should therefore be sterilized as follows: Douche the vagina and vulva with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and scrub the external organs, the perineum, the anal region, and inner surface of the thighs with a gauze sponge saturated with warm water and tincture of green soap. The parts are then irrigated with a solution of corrosive sublimate.

Position of the Patient.—Dorsal position.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Anesthesia.—The use of a general anesthetic is contraindicated if the patient is profoundly cachectic or a grave kidney lesion is present, and under these circumstances a 4 per cent. solution of cocain should be applied to the vagina and vulva on a piece of absorbent cotton.

Instruments.—(1) Simon's speculums (curved and flat blades); (2) right and left Emmet's slightly curved scissors; (3) three long hemostatic forceps; (4) two short hemostatic forceps; (5) two bullet forceps; (6) dressing forceps; (7) sharp spoon curet; (8) needle-holder; (9) two small full-curved Hagedorn needles; (10) plain cumol catgut No. 2—three envelopes; (11) thermocautery.

Operation.—Simon's speculums are introduced into the vagina and the field of operation exposed to view. The vagina is then dried with gauze sponges and a careful examination made of the diseased area.

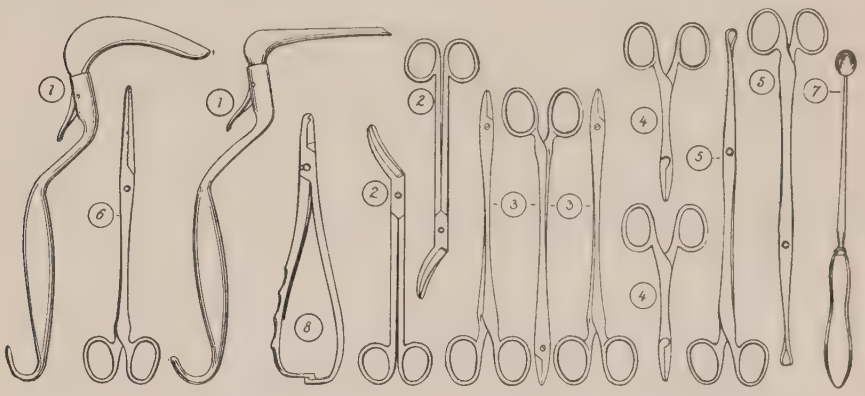


FIG. 427.—INSTRUMENTS USED IN THE PALLIATIVE OPERATION FOR CANCER OF THE CERVIX.

The friable structures are now cautiously scraped away with the curet until apparently healthy tissue is reached, and the uneven and ragged edges of the wound are cut off with curved scissors. The blood and fragments of tissue are removed from the vagina with a gauze sponge and the cureted surfaces cauterized with the thermocautery. The vagina is then irrigated with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and thoroughly dried. It is then packed with iodoform gauze and the vulva protected with a compress held in position by a T-bandage.

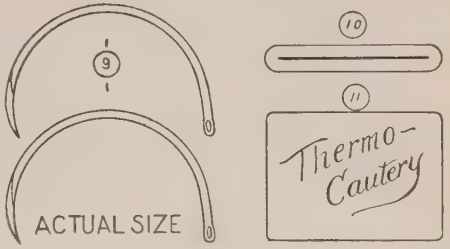


FIG. 428.—NEEDLES, SUTURE MATERIAL AND CAUTERY USED IN THE PALLIATIVE OPERATION FOR CANCER OF THE CERVIX.

Special Directions and Variations in the Technic.—The blood and fragments of cancerous tissue which collect in the vagina during the process of curetment should be removed from time to time by a gauze sponge and the field of operation kept well exposed. This is an important part of the technic, as it is necessary to see exactly what tissues are being removed by the curet and avoid the danger of making a false opening into a neighboring organ.

If the bladder or rectum is involved, a careful examination must be made by

touch before beginning the operation. A sound should be introduced into the bladder and the anterior wall of the vagina palpated to determine the thickness of the intervening tissues. The rectovaginal septum should also be examined for the same purpose. There is always more or less danger of making a false passage, and it can only be prevented by a very cautious manipulation of the curet, guiding it not only by the eye but also by the sensations conveyed to the fingers through the handle of the instrument. If the bladder or rectum is opened, nothing can be done to repair the injury and a permanent fistula results. If an opening is made through the vaginal vault into the peritoneal cavity, it should be closed at once with a tampon of gauze, which is removed after the operation is completed and reapplied when the vagina is finally packed with gauze. Should this accident occur, the vagina must not be cleansed by irrigation after the operation, as some of the fluid may gain access into the peritoneal cavity and cause infection or corrosive sublimate poisoning. Under these conditions the cleansing should be done with a gauze sponge saturated with normal salt solution, and after the vagina is dried, it should be packed, as usual, with iodoform gauze.

In the beginning of the operation the hemorrhage is usually severe, but it ceases almost entirely when the friable tissues have been scraped away. If a vessel spurts, it should be controlled by touching it with the cautery, by passing a curved needle threaded with catgut immediately beneath it, or by seizing it with a hemostatic forceps, which should not be removed for forty-eight hours. Sometimes the circular or uterine artery may be wounded and require ligation. The general oozing which occurs after the operation is controlled by the packing of iodoform gauze.

The cautery should be kept at a dull red heat. The actual cautery may be substituted for the thermocautery when the latter apparatus is not at hand. Good results are also obtained with the galvanocautery. The cautery is preferable to the application of pure sulphuric or nitric acid, as the heat penetrates more deeply and destroys the infection in the underlying tissues. If, however, an acid is employed as a substitute, the healthy mucous membrane should first be protected by smearing it with vaselin, and subsequently the chemic agent should be neutralized by applying small pledgets of absorbent cotton soaked in a saturated solution of sodium bicarbonate to the parts.

Sometimes it is best to cut away portions of the cervix with scissors before using the curet, and under these circumstances the bullet forceps is a very useful instrument to seize and steady the parts. The forceps can also be used in the same way in trimming off the ragged and irregular margins of the cureted surfaces.

After-treatment.—*Care of the Wound.*—The gauze packing is removed from the vagina in twenty-four hours and not reintroduced. The vagina is then irrigated once a day with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and a gauze compress placed over the vulva.

If the peritoneal cavity was opened at the time of the operation, the gauze packing should not be disturbed for forty-eight hours. The patient is then placed in the dorsal posture and the vaginal tampon removed. Simon's speculum is then introduced and the vagina cleansed with a gauze sponge saturated with hot normal salt solution. After drying the parts the gauze packing is carefully withdrawn from the opening into the peritoneal cavity and a fresh tampon introduced. The vagina is then packed with iodoform gauze as in uncomplicated cases. Fresh dressings should be applied daily while the patient remains in bed.

The Bladder.—The urine should be voided spontaneously or drawn with a catheter every eight hours.

The Bowels.—The bowels should be moved on the second day by a mild laxative, followed by an enema of soapsuds and warm water, and then kept opened daily by the same means.

The Diet.—During the first twenty-four hours a liquid diet (see p. 106) should be given and then the patient should be placed upon a convalescent diet (see p. 114).

Restlessness and Pain.—The free use of opium is indicated.

Getting Out of Bed.—The patient should remain in bed for one week or ten days.

The Subsequent Treatment.—After the patient gets out of bed every effort must be made to control the character and quantity of the discharge and protect the vulva from its irritating influences.

The first of these indications is met by the use of medicated vaginal douches, which should be used night and morning, or oftener, if the case requires it. The following drugs are beneficial and non-irritating to the parts: creolin, f℥ij to the quart; lysol, 1 per cent. solution; potassium permanganate, 1 to 3000; carbolic acid, 3 to 5 per cent.; and corrosive sublimate, 1 to 2000. When these agents are employed, the douche should be followed by an injection of hot normal salt solution to prevent local irritation or poisoning from absorption.

The daily use of hydrogen peroxid is of great advantage when the discharge becomes offensive. It should be used in the morning just before the medicated douche is given and the patient should lie on her back and inject two or three ounces of the remedy into the vagina with a hard-rubber syringe.

The ulcerative process is frequently held in check and more or less modified by the use of methylene-blue or -violet. The dry powder of either preparation may be dusted over the ulcerated surface through a speculum, or a 1 per cent. solution may be applied with a tampon as a lotion. Petroleum (refined oil) has also given good results in these cases. An ounce of the oil is injected every day into the vagina and kept from escaping by inserting a cotton-wool tampon.

If the bleeding becomes excessive during the later stages of the disease, it is controlled by the daily use of copious hot-water vaginal injections (2 gallons) and a tampon of iodoform gauze. This treatment should be continued so long as the bleeding lasts. Good results are also obtained by the use of a large cotton-wool tampon wet with a saturated solution of alum.

The patient is made more comfortable by protecting the external organs from contact with the irritating vaginal discharges by washing the parts night and morning with warm water and soap; applying carbolized vaselin (3 per cent.); and wearing a vulvar pad to absorb the secretions.

Pain.—This symptom must be controlled with opium, and the dose gradually increased as the disease advances. It should be given in the form of a suppository or administered hypodermically.

Constipation.—The tendency to constipation is relieved by regulating the diet (see p. 103) and administering a mild laxative or a rectal enema (see p. 104). The occasional use of a saline is of advantage and often relieves the distressing rectal symptoms which are frequently associated with constipation.

Exhaustion.—The surroundings of the patient must be made as cheerful as possible and her mind kept from brooding over her troubles. She should not be told of the nature of her disease unless there are reasons for doing so, and at any rate the word "*cancer*" must never be used in her presence.

The diet should be easily digested, appetizing, and nutritious. Alcoholic stimulation is important and may be given in the form of a red wine or champagne at lunch and dinner, or a milk-punch containing about one ounce of whisky may be taken three times a day. The amount of alcohol depends upon the

indications, and judgment must be used to prevent over-stimulation. The necessity of regulating the diet so as to prevent constipation has already been referred to.

The patient should have plenty of fresh air and sunshine and she should walk or drive every day if her strength and opportunities permit.

Very few drugs are indicated internally. The use of opium to relieve pain has been referred to. Sulphonal and trional are at times useful to promote sleep, and strychnin is often indicated for its stimulating action. I have derived good results from the following formula, which should be given for an indefinite period after the operation of curetment and cauterization:

℞. Hydrargyri chloridi corrosivi,
Acidi arsenosi ..... āā gr. j
Extracti nucis vomicæ, ... gr. xxv
Ferri et quininæ citratis, ... gr. cc
M. et ft. pil. c.
Sig.—One pill three times daily after meals.

When the kidneys are affected and symptoms of uremia occur, the medicinal and dietetic treatment is based upon general medical principles.

Dribbling of Urine; Escape of Feces.—The management of these conditions is fully discussed under the treatment of vesicovaginal and rectovaginal fistulas.

The Use of the *x*-rays.—The *x*-ray treatment of cancer of the cervix is discussed on page 75.

Complicating Pregnancy.—The treatment of carcinoma of the cervix occurring during pregnancy should be considered under two headings:

1. Those cases in which the disease is limited to the uterine tissues.

2. Those cases in which the carcinomatous degeneration has involved the surrounding structures.

Disease Limited to the Uterine Tissues.—*The life of the mother alone should be considered when the disease is limited to the uterine tissues.* No time, therefore, should be lost before resorting to abdominal hysterectomy, which is the operation of selection. If the child is viable, cesarean section should precede the hysterectomy. The radical operation should never be delayed, even for a few weeks, in order to allow the fetus to reach viability, as the disease develops very rapidly during pregnancy and the life of the mother may be sacrificed. Furthermore, a living child under these circumstances is the exception and not the rule. The induction of abortion or premature labor is always likely to be followed by hemorrhage and sepsis, and hence neither of these operations should ever precede the removal of the uterus.

Disease Involving the Surrounding Structures.—In these cases the radical operation is not indicated, as there is no hope of eradicating the disease, and consequently *the life of the child should be considered, as the death of the mother is eventually certain.*

If the general health of the patient is fairly good and she is not rapidly losing flesh or becoming cachectic, the pregnancy should be allowed to continue until the child is viable. When this period is reached, the fetus should be delivered by cesarean section and the uterus immediately amputated above the cervix (*supravaginal hysterectomy*). Cesarean section alone is a more dangerous procedure in these cases, and while septic infection is always to be dreaded, yet there is less likelihood of its occurrence when the uterus is removed above the cervix. Delivery by the natural passages is very dangerous both to the mother and to the child. The rigidity of the cervix, the great danger of a laceration occurring and extending into important structures, risks of hemorrhage and sepsis, and the

likelihood of a ruptured uterus are conditions that combine to make this method of delivery far more fatal than when the child is delivered by the abdominal route.

If during the course of gestation the patient begins to lose flesh rapidly and becomes profoundly anemic or cachectic, the pregnancy should not be allowed to continue, as the vitality of the fetus is necessarily impaired and the prospects of delivering a living child when the period of viability is reached are very poor, and consequently the mother should not be permitted to suffer the additional drain upon her system. Under these circumstances cesarean section followed by supravaginal hysterectomy should be performed at once, and if the gestation is not far advanced it is unnecessary to remove the contents of the uterus before amputating it above the cervix.

If the fetus dies *in utero*, the operation of supravaginal hysterectomy should be performed at once.

As has already been stated, delivery by the vaginal route is especially dangerous when the cervix is the seat of cancer, and consequently the induction of abortion or premature labor is contraindicated. In all cases the abdominal route is by far the safest, and the fetus should be removed, either with the uterus or by cesarean section, before amputating it above the cervix, if the pregnancy is far advanced.

The palliative treatment should be employed in hopeless cases, both in the interest of the mother and of the child, and the symptoms of discharge, hemorrhage, pain, constipation, exhaustion, and the escape of feces or urine must be relieved by the methods which are recommended in cancer of the cervix uncomplicated by pregnancy. The operation of curetment and cauterization is, therefore, not contraindicated when the discharge and hemorrhage can be checked or controlled by removing the friable tissues of the cervix. When, however, the fetus is within three or four weeks of viability, the operation should be delayed until after the child is delivered by the abdominal route, on account of the danger of causing abortion. If, however, gestation is not so far advanced, the operation should be performed at once, as there are more risks to the fetus from delay, on account of the drain upon the mother's system impairing its vitality and thus lessening its chances of reaching viability, than of an abortion occurring.

Recurrence after a Radical Operation.—The disease returns almost invariably at the seat of removal in the vaginal vault. A recurrence seldom takes place in the glands or in the structures beyond without a local involvement first manifesting itself; metastasis after hysterectomy is, therefore, seldom met. The local return of the disease is due in most cases to a continuance of the cancerous growth, while in other instances it is accounted for by the inoculation or implantation of cancer cells at the time of the operation.

The symptoms of recurrence are the same as those already described in primary cancer of the cervix. The patient's attention is usually first attracted by slight hemorrhages and a discharge. In rare instances, however, there is a loss of strength and weight before the local symptoms manifest themselves. A vaginal examination reveals the indurated and nodular condition of the vault of the vagina, and later on the characteristic ulcerative changes of malignancy develop. The progress of the disease is the same as in cases that have not been operated upon by hysterectomy and the physical signs and the local and general symptoms do not differ.

The treatment is the same as in inoperable cases of primary cancer of the cervix, and consists of palliative measures (see p. 408) and the use of the *x*-rays (see p. 75).

SARCOMA.

Causes.—Sarcoma may attack the uterus as a *primary* or a *secondary* condition. The latter is very seldom met, and when it occurs, the disease usually starts in one of the ovaries and extends to the uterus by continuity. Primary sarcoma is a comparatively rare disease, although it occurs more frequently than was formerly supposed, as it has been shown that sarcomatous degeneration is not an uncommon occurrence in a uterine fibroid. The disease usually starts in the body of the uterus, but occasionally the cervix is the primary seat of the affection.

Nothing is known of the cause of sarcoma. While the majority of cases occur between forty and fifty years of age, yet all ages are liable, and the affection has been observed in young children and in very old women. Pregnancy or the traumatisms of labor have no predisposing effect upon the disease, as it attacks nulliparæ more frequently than women who have borne children. The coexistence of sarcoma of the body of the uterus and cancer of the cervix has been occasionally observed.

Pathology.—Sarcomata of the uterus may be classified into:

1. Those primarily affecting the parenchyma.
2. Those primarily affecting the endometrium.

Disease Primarily Affecting the Parenchyma.—This variety is known as fibrosarcoma, sarcoma of the uterine parenchyma, circumscribed fibrosarcoma, and recurrent fibroid. The disease begins in the uterine parenchyma, or probably more frequently in the connective tissue of a fibroid tumor of the uterus, and grows toward the uterine cavity or toward the peritoneal surface of the organ, and is, therefore, either interstitial, submucous, or subserous in situation. The malignant growth appears in the form of multiple nodules of various size, which are not surrounded by a capsule but which gradually involve the neighboring tissues and eventually break down and slough. A submucous nodule may become pedunculated and form a polypus which may cause inversion by dragging upon the fundus of the uterus. Sometimes one of these polypi may act as a ball-valve at the internal os and cause a temporary retention of the uterine secretions.

Disease Primarily Affecting the Endometrium.—This variety is known as diffuse sarcoma, and starts in the endometrium, usually at or near the fundus. It appears as soft papillary or lobulated growths which, as a rule, project from a circumscribed area, although they may occasionally involve the whole surface of the mucosa. Sometimes the outgrowth consists of a single tumor which is round or oval in shape and soft in consistency, or it may resemble a hydatid mole, when it springs from the cervix and appears as a bunch of transparent cysts containing a thick, viscid fluid. Occasionally the sarcomatous mass forms a polyp-like tumor which may be mistaken for a benign growth when it protrudes from the external os.

Diffuse sarcoma develops rapidly, infiltrates the uterine walls, and forms nodular masses on the peritoneal surface of the uterus, which becomes adherent to adjacent organs. Ulceration and sloughing occur early in the course of the disease, destroying the parenchyma and forming a large crater-like cavity.

Extension.—The disease may extend by continuity or by metastasis. If it advances by the former method, the adjacent organs eventually become involved and the disease spreads to the vagina, the bladder, the rectum, and the abdominal and pelvic cavities, and produces the same ulcerative lesions that are observed in the later stages of cancer of the cervix. Metastatic involvement may occur in the peritoneum, the connective tissue of the pelvis, the vagina, the lungs, the pleura, the liver, the vertebras, the skin, and in other organs.

Symptoms.—The symptoms of diffuse sarcoma differ so materially from those of fibrosarcoma that it will be necessary to consider them separately.

Diffuse Sarcoma.—The symptoms resemble so closely those of cancer of the body of the uterus that clinically it is impossible to point out any characteristic differences between them, and as the hemorrhage, the discharge, the pain, and the general symptoms are the same, it would, therefore, be a useless repetition to refer to them again. (See symptoms of cancer of the body of the uterus, p. 392.)

Fibrosarcoma.—This form of sarcoma almost invariably occurs as a degenerative change in uterine fibromata, and the symptoms in the beginning are, therefore, characteristic of the benign tumor and not of the malignant growth. (See symptoms of uterine fibroids, p. 373.)

So uncertain are the symptoms and the physical signs of sarcomatous degeneration occurring in these tumors that the disease is not even suspected, in the vast majority of instances, before the growth is examined microscopically after its removal. In a general way the sudden occurrence of pain and rapid growth in a fibroid tumor point to some form of secondary degeneration taking place; but these symptoms do not indicate the nature of the lesion, and consequently the diagnosis is far from certain or satisfactory. (See diagnosis of secondary changes, p. 381.)

Even in the later stages of the disease the local cardinal signs of malignancy—*profuse hemorrhages* and *offensive discharges*—do not manifest themselves unless the growth is submucous or attacks a fibroid polypus and involves the endometrium in the ulcerative changes which take place. A deeply seated interstitial tumor or one that is situated beneath the peritoneum rarely involves the uterine mucosa, and consequently the symptoms do not differ clinically from those caused by fibroid tumors.

Diagnosis.—An early diagnosis must be made of sarcoma of the uterus if a permanent cure is to be hoped for from a radical operation.

This subject is fully discussed under cancer of the cervix and the body of the uterus.

The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.
The microscopic examination.

The History.—There is very little knowledge to be gained from the history of the patient, although her age has some bearing upon the nature of the lesion, as the majority of cases occur between forty and fifty; yet it must not be forgotten that the disease may attack very old women and young children. Another fact of some importance is that sarcoma is more frequent in nulliparæ than in women who have borne children, and consequently the traumatisms of labor do not act as predisposing causes.

The Symptoms.—Diffuse Sarcoma.—The symptoms of this variety are discussed under cancer of the body of the uterus on page 393.

Fibrosarcoma.—Unless ulcerative changes have occurred in the endometrium the symptoms do not differ from those caused by uterine fibroids. After these changes have taken place, however, the profuse and constant hemorrhage and the foul, disgusting nature of the discharges indicate disintegration and possible malignancy.

The Physical Signs.—The physical signs are studied by (*a*) touch, (*b*) sight, (*c*) smell.

T o u c h .—The patient is placed in the dorsal position and the examination made by *vaginal touch* and *recto-abdominal* and *vagino-abdominal* palpation. The vagina and cervix are first examined, and then the body of the uterus, and finally the pelvic structures are carefully palpated by the combined methods.

Diffuse Sarcoma.—If the disease is situated in the body of the uterus, the organ will be found to be somewhat enlarged; tender upon pressure; and more or less softened. The enlargement is usually uniform except when nodules are formed beneath the peritoneum which give the uterus an asymmetric or irregular shape. The organ is movable in the beginning, but it eventually becomes fixed in the pelvis by adhesions or by extension of the disease to neighboring structures. The existence of an old inflammatory lesion as a possible cause of fixation must be borne in mind. (See cancer of the cervix, p. 405.) The cervical canal is usually patulous or easily dilated and the examining finger may sometimes be passed into the uterine cavity. Polyp-like masses are readily felt when they project into the cervical canal and the friable nature of the tissues indicates their malignant character. Secondary involvement of the vagina is easily detected by the examining finger, but it is impossible to recognize sarcomatous involvement of the ovaries and oviducts with any degree of certainty, as the organs may be enlarged from other causes.

When the disease begins in the cervix the characteristic outgrowths may be felt by the examining finger if they project from the external os. The cervix itself is enlarged and somewhat softer than normal and its canal is usually widely dilated.

Fibrosarcoma.—In the beginning the physical signs are the same as those found in uterine fibroids. But as the disease progresses and the nodular masses begin to soften the change in their consistency may be detected by bimanual palpation if they are situated on the surface of the uterus. When a submucous nodule becomes pedunculated, it may project into the cervical canal and be felt by the examining finger.

S i g h t .—The speculum gives but little information unless the sarcomatous mass projects into or beyond the external os uteri.

S m e l l .—In the *diffuse variety* of sarcoma the discharges may be without odor during the early stages of the disease, but later on they become foul and disgusting, as in cancer of the body of the uterus. In *fibrosarcoma* the discharges are not purulent and fetid in character unless the endometrium is involved and disintegration occurs.

The Microscopic Examination.—The diagnosis is based upon the microscopic findings. The subject is fully discussed under cancer of the body and neck of the uterus on pages 394 and 403.

Prognosis.—Death invariably results unless the disease is cured by a radical operation. The average duration of life in a case uninterrupted by treatment is about three years; death may occur, however, as early as four months or as late as ten years. The duration of life is longer and the operative prognosis is much more favorable in fibrosarcoma than in the diffuse variety.

Differential Diagnosis; Recognition of the Involvement of the Periuterine Tissues; Causes of Death; Treatment.—These subjects are fully considered under cancer of the cervix and the body of the uterus.

INFLAMMATION.

Inflammation of the uterus will be considered under two headings:

Endometritis, or inflammation of the corporeal mucosa.

Endocervicitis, or inflammation of the cervical mucosa.

The starting-point of inflammatory affections of the uterus is generally the endometrium, and the disease may eventually extend to the muscular walls of the uterus and even to the peritoneum. Metritis, or inflammation of the uterine parenchyma, is, therefore, not a distinct or a separate disease, but a condition that is secondary to an infection of the endometrium. Sometimes the peritoneal coat of the uterus is primarily affected and the disease subsequently involves the parenchyma of the organ and finally the endometrium. These cases are, however, comparatively rare, and are due to septic inflammation in one of the pelvic organs causing an adhesion between it and the uterus. Again, a laceration of the lower segment of the uterus may be followed by septic infection which may extend into the parenchyma before involving the endometrium.

In the light of modern pathology inflammation of the uterine mucosa becomes a subject of vital importance, as it is the starting-point of nearly all the inflammatory lesions of the pelvic organs.

Endometritis or endocervicitis may exist alone, but, as a rule, the inflammation is not limited to either the uterine or cervical canal, but involves the whole uterine mucous membrane.

ENDOMETRITIS.

Inflammation of the corporeal endometrium is divided into five varieties:

Congestive endometritis.
Constitutional endometritis.
Gonorrheal endometritis.
Septic endometritis.
Senile endometritis.

The first two varieties are usually spoken of under the term "*simple endometritis,*" in contradistinction to the graver forms of the disease.

Congestive Endometritis.

Definition.—A non-specific inflammation of the corporeal endometrium which is always subacute or chronic in character and which is characterized by hypersecretion of the utricular glands.

Pathology.—The disease presents itself in two varieties—*glandular and interstitial endometritis.* In the former the utricular glands are hypertrophied and increased in number, and in the latter there is a connective-tissue overgrowth between the uterine follicles.

As a rule, congestive endometritis is characterized by general hypertrophy of the mucosa, but in some cases, however, it does not involve the entire endometrium and is limited to circumscribed areas. When the hypertrophy is excessive, the name of "*fungoid endometritis*" is given to the disease. Occasionally in the glandular variety polypoid outgrowths develop upon the mucosa and form the so-called *mucous polypi.* In some cases at each menstrual period the endometrium is exfoliated in shreds or thrown off as a cast of the uterine cavity. When this phenomenon occurs, the name of "*exfoliative endometritis*" is given to the disease. (See Membranous Dysmenorrhea, p. 719.)

Both varieties of endometritis are frequently found in the same uterus, affecting either separate portions of the mucous membrane or existing side by side.

Atrophic changes may occur in old chronic cases of endometritis and entirely replace the mucosa and its glandular elements by a connective-tissue membrane.

Causes.—This variety of endometritis is due to congestion and is caused by any pathologic condition that produces stasis in the circulation of the uterus or the pelvis.

The following are the chief causes:

Uterine displacements, especially flexions.
Uterine tumors and polypi.
Subinvolution of the uterus.
Lacerations of the cervix, especially when they are associated with eversion of the intracervical mucosa.
Pelvic tumors and adhesions.
Tubal disease.
Suppression of menstruation from exposure to cold and from cold douching during the menstrual flow.
Acquired stenosis of the cervical canal.
Chronic constipation.
Sexual excesses.
Exanthemata.
Improper method of wearing the clothing.

Symptoms.—The disease develops slowly and is subacute from the beginning. Its onset, as a rule, is so insidious that patients cannot remember the exact time when the leukorrheal discharge first appeared.

Many of the symptoms complained of by the patient are not due to the pathologic changes in the endometrium but to the causative lesions and associated complications. Thus, there may be present a group of symptoms that are caused by a lacerated cervix, a displaced uterus, or pelvic adhesions which may change the local and general manifestations dependent upon the endometritis itself.

The following are the chief symptoms of the disease:

Leukorrhea.
Hemorrhage; Menstrual disturbances.
Pain.
Sterility and abortion.
General symptoms.

Leukorrhea.—Hypersecretion of the utricular glands is one of the chief symptoms. The discharge is usually thin and serous in character, but it may at times, however, become mucopurulent or even purulent. In some cases it may have a milky appearance, and in others it may be mixed with a small quantity of blood. It is usually without odor and is non-irritating, but when the patient is uncleanly in her habits decomposition may occur and the discharge, becoming very offensive, may be mistaken for malignant disease of the uterus. As a rule, the intracervical mucosa is also inflamed and the secretions from the cervix mix with those from the uterine cavity and give a thick and viscid consistency to the discharge. The vaginal secretions also become mixed with it, and by the time the discharge reaches the vulvar orifice it contains the secretions from the uterus, the cervix, and the vagina.

The character and the quantity of the leukorrhea often depend upon the variety of the disease and the condition of the endometrium. The discharge is profuse when the mucosa is hypertrophied, but it becomes very slight in amount after atrophic changes have occurred. It is usually very profuse in the glandular variety and is frequently purulent in the fungoid form of the disease or when the endometrium is the seat of mucous polypi. The general pelvic congestion that

occurs at each monthly period increases the discharge, and it is therefore very profuse for two or three days before and after menstruation.

Hemorrhage; Menstrual Disturbances.—Unless the mucosa is decidedly hypertrophied menstruation is generally unaffected, and in a large proportion of the cases, therefore, no menstrual disturbances or hemorrhages occur. Menorrhagia or metrorrhagia or both frequently accompany the interstitial variety, and are marked and persistent symptoms when the endometrium takes on a fungoid or polypoid change. In the latter instance the menorrhagia is so free and the intermenstrual hemorrhages so severe that they are out of all proportion to the character of the local lesions, and the presence of a submucous fibroma may be suspected. Menstruation is sometimes accompanied by pain, especially in the interstitial variety, and symptoms of the congestive form of dysmenorrhea are not an uncommon occurrence when there is marked hypertrophy of the endometrium.

When the uterine mucosa is atrophied the menstrual flow is lessened in amount and more or less watery in character, and is accompanied by an intermittent hypogastric pain which begins several hours before the bleeding occurs.

Pain.—As a rule, when pain is present it is caused by the causative lesion and not by the endometritis. Sometimes, however, various local and reflex pains may be directly due to the inflamed mucosa, and there may be vertical or occipital headache, pain in the lumbosacral, the inguinal, or the hypogastric region, and occasionally also a burning sensation immediately behind the symphysis pubis.

Sterility and Abortion.—Sterility and abortion are very common results of endometritis, as the mucosa becomes so altered by the disease that it is no longer suitable for the attachment of the ovum or the formation of the decidua, and furthermore the changed uterine secretions are destructive to the life or the activity of the spermatozoa. There is, however, only a relative sterility in these cases, and should conception occur abortion is more than likely to eventually result, as the diseased mucous membrane cannot, in many instances, undergo the physiologic changes of pregnancy.

When atrophic changes occur in the endometrium, conception rarely takes place, as the lesion destroys, more or less completely, the structure of the mucous lining of the uterine cavity.

General Symptoms.—Neurasthenic symptoms are not uncommon. The patient is often nervous and hysteric and, at times, there is more or less depression of spirits and a lack of desire for any form of mental or physical exertion. General debility, loss of appetite, and anemia are frequently met, and are due to the menstrual irregularities, the local symptoms, and the gastro-intestinal disturbances which accompany the disease. Dyspepsia and intestinal flatulence are often associated with these cases, and there is also a marked tendency to constipation, which still further contributes to the ill health of the individual.

The general symptoms are not always well marked in endometritis, and in cases in which the local lesions are slight there may be no systemic disturbances whatever. Again, the local and general effects of the causative lesions and other complications must not be lost sight of, as they are often responsible for symptoms that are wrongly attributed to the inflamed uterus.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.
The microscopic examination.

The History.—The history of the patient may aid at times in making the diagnosis. Unmarried women are not, as a rule, liable

to the septic or the specific varieties of the disease. Married women, on the other hand, frequently suffer from the graver forms of endometritis, as they are more or less exposed to septic and specific infections. The insidious onset of the attack and a lack of knowledge upon the part of the patient as to when the discharge first appeared are significant and point to a simple variety of the affection. Grave infections come on suddenly and are usually, except in the case of gonorrhea, acute in the beginning and accompanied by well-marked symptoms.

The history of a previous operation upon the uterus or of intrauterine treatment may suggest some form of septic infection, as the endometrium often becomes infected, under these circumstances, from want of care in the antiseptic precautions. This is especially true where local applications are made to the uterine mucosa by the physician at his office. And, finally, a careful inquiry should be made of all facts in the previous history of the case that might be a possible cause of septic infection, as, for example, puerperal septicemia and like conditions. A thorough knowledge, therefore, of the patient's history will often enable us to exclude the graver forms of the disease and to conclude, with reasonable certainty, that the endometritis is congestive in type, unless the physical examination reveals some other cause.

The Symptoms.—The only subjective symptom that is at all characteristic is the leukorrheal discharge. But the presence of a leukorrhea means very little from a diagnostic standpoint until its origin is ascertained by a physical examination, as we cannot tell from its appearance whether it comes from the uterine cavity, the cervix, the vagina, the Fallopian tubes, or from a ruptured pelvic abscess. Furthermore, the secretion from the utricular glands always becomes more or less mixed with the cervical and vaginal discharges before it reaches the vulva, and consequently its appearance and character are so altered and changed that the source of the trouble is very uncertain. On the other hand, however, we must bear in mind that in a very large proportion of cases a leukorrheal discharge is uterine in origin, and consequently we may assume, when this symptom is present, that the endometrium is the seat of the disease.

The Physical Signs.—The physical signs are studied by (*a*) touch and (*b*) sight.

Touch.—The patient is placed in the dorsal position and the examination made by vaginal touch combined with *recto-abdominal* and *vagino-abdominal palpation*.

We first endeavor to discover a cause for the disease. This may be found in a lacerated cervix, in a retrodisplaced, subinvoluted uterus, or in one of the various gross pelvic lesions referred to under etiology. Having found the probable cause of the uterine congestion, we next examine the uterus itself for any change in its size, shape, or consistency that may result directly from the disease. As a rule, there are no changes in the uterus that can be detected by palpation except those which are caused by the causative lesion. If, however, the mucosa is greatly hypertrophied or there are fungoid or polypoid outgrowths present, the shape of the uterus is rounder than normal, the cervical canal is somewhat patulous, and the consistency of the corporeal and cervical parenchyma is more or less softened, and sometimes the fundus may be tender on pressure; but these local conditions are exceptional, unless they are due to periuterine disease.

Sight.—The speculum reveals the origin of the discharge which is seen

escaping from the mouth of the womb. As has already been stated, the secretion of the utricular glands is usually mixed with the discharge from the cervix, and consequently it is necessary to cleanse the cervical canal with a pledget of cotton before the unmixed corporeal mucus can be seen. This can only be accomplished when the cervix is lacerated and the intracervical mucosa is everted.

The speculum also shows the size and shape of the cervix and the presence or absence of a pathologic lesion.

The Microscopic Examination.—As the operation of dilatation and curetment of the uterus always enters into the routine treatment of congestive endometritis it is unnecessary to resort to this operative procedure for the sole purpose of diagnosis, and while in the majority of instances there is no difficulty in determining the nature of the disease without the aid of the microscope, yet the curet scrapings should always be sent to a pathologist for examination as a precaution against overlooking a beginning malignant degeneration.

Differential Diagnosis.—Congestive endometritis may be mistaken for the following lesions:

Malignant disease of the body of the uterus.
Incomplete abortion.
Discharges coming from the Fallopian tubes, the vagina, or a ruptured pelvic abscess.

The differential diagnosis of congestive endometritis is usually not difficult except where a purulent discharge or hemorrhages occur from the uterus, as is the case when the endometrium is the seat of fungoid or polypoid outgrowths. Usually there is not the slightest evidence either in the history of the case or in the physical signs to cause even a suspicion of the presence of malignant disease. In the fungoid or the polypoid variety, however, the blood and the discharges, which are often retained and become offensive, render the diagnosis uncertain without the aid of the microscope.

Sometimes a vaginal discharge may come from the Fallopian tubes, the vagina, or a ruptured pelvic abscess, and be mistaken for endometritis. The differential diagnosis in these cases is made by the history of the case and by the physical examination.

As a rule, when the discharge comes from the Fallopian tubes it is more or less intermittent and frequently accompanied by pain. The discharge, which is purulent and very profuse, ceases as soon as the tube empties itself, but reappears again along with painful contractions when it refills. These patients have also a history of some form of infection followed by a chronic inflammatory lesion of the pelvis which is revealed by a physical examination (*recto-abdominal* and *vagino-abdominal palpation*). The pelvic mass decreases in size while the discharge continues, but enlarges again when the tube begins to refill.

If the discharge has its origin in the vagina, the history will point to some form of vaginitis, and an inspection of the parts through a speculum will reveal the presence of a vaginal inflammation.

A pelvic abscess is more likely to rupture into the rectum or into the vagina than into the uterine canal. The diagnosis is made by finding the fistulous opening. The patient is placed in the dorsal position and the vagina thoroughly irrigated with warm water. A speculum is then introduced and the canal dried with gauze sponges. The vagina is now carefully inspected, beginning with the vault and continuing the examination until the entire surface has been thoroughly scrutinized. If a sinus is discovered, pus will be seen escaping from it, and the diagnosis may be confirmed by passing a probe into the false opening. Sometimes no evidence whatever of a fistulous tract is observed until pressure is made upon the pelvic contents either through the rectum or through the abdominal wall above the pubes,

when pus may be seen escaping into the vagina. In cases where doubt exists as to the source of the discharge a cotton-wool tampon placed against the external os uteri for several hours will collect the secretions if they come from the uterus and settle the question of diagnosis.

Prognosis.—This variety of endometritis seldom causes grave pelvic complications. The practice of making intrauterine applications, the use of the uterine sound, or a careless antiseptic operative technic may cause a serious infection and convert a simple endometritis into one that may destroy the life or the future health of the patient.

The etiology of the disease and the character of the causative lesions must always be considered. An endometritis due to a lacerated cervix is a simple affair compared with a case where the affection is due to a pelvic lesion or to a tumor of the uterus. Consequently not only must we consider the curability of the causative lesion, but also the dangers to life involved in its treatment and cure. Furthermore, unless the cause is recognized and removed the endometritis will recur after it has apparently been cured. And, finally, unless the treatment of the disease is intelligently and properly carried out no results may be expected.

The possibility of fungoid or of polypoid endometritis being a predisposing cause of cancer of the corporeal mucosa should always be borne in mind.

Treatment.—The treatment is divided into:

The prophylaxis.
The removal of the cause.
The cure of the disease.

The Prophylaxis.—A knowledge of the causes of congestive endometritis and their prevention are the essential factors in the prophylactic treatment of the disease. Although many of the causes cannot be controlled, yet in a fair proportion of cases they can be entirely prevented, as the affection is frequently due to traumatisms of labor, improper treatment during the puerperal state, and injurious habits, which are all causative conditions that can usually be guarded against.

The Removal of the Cause.—There is always a definite cause which we may or may not be able to discover, and unless it is removed any attempt to cure the disease is useless, as it is certain to recur within a short time after treatment. For example, if the uterine congestion is due to a retrodisplaced uterus, a lacerated cervix, or a pelvic tumor, the indication is to remove the pathologic lesion and at the same time or subsequently to treat the diseased endometrium. Again, if the disease is the result of injurious habits they must first be corrected before the local condition is remedied.

Whenever it is possible to do so, the diseased mucosa should be treated at the same time the cause is removed. This can readily be done when the cause is a lacerated cervix or a displaced uterus, by first dilating and cureting the uterine cavity and immediately afterward repairing the cervix or performing a ventral suspension of the uterus, as the case may be. In some instances, however, the treatment of the endometrium should be postponed for a future occasion, as the causative lesions may have resulted in fixation of the uterus, and consequently an attempt to dilate and curet its cavity may result in severe or even dangerous traumatism.

When the disease is not caused by a pelvic lesion, but is due to sexual excesses, constipation, improper methods of wearing the clothing, imprudences during the monthly periods, etc., in addition to the correction of these injurious influences and the subsequent curetment of the uterine cavity a special plan of general and local treatment is demanded for the relief of the pelvic congestion. In these cases the food should be nourishing and easily digested; red meats should be

sparingly eaten; and pure water should be freely taken between meals. The Buffalo Lithia, Poland, and distilled waters are beneficial under these circumstances, as they contain but a small amount of solid ingredients and thoroughly flush the system. The bowels should be opened daily. Any tendency to constipation increases the pelvic congestion and adds to the local trouble. The daily use of a mild laxative and the weekly administration of a saline purge will usually be sufficient to keep the bowels free. Salines are especially beneficial, as they lessen the congestion; they should therefore always be employed, either as a weekly purgative, or used daily in place of a simple laxative. Good results follow the use of Hunyadi Janos and saline mineral spring waters, especially those containing sodium chlorid. The patient should exercise daily in the open air. Driving, riding, and walking are beneficial, but the use of the bicycle should be avoided. Indoor exercises should be employed to strengthen the pelvic organs and the muscles of the abdomen and to stimulate the circulation of the pelvis (see p. 117). General massage is also indicated in these cases and should be given daily or at least three times a week. A properly made abdominal binder (see p. 850) should be worn when the belly-wall is relaxed or pendulous, as it acts as a support to the pelvic organs and increases the retentive power of the abdominal cavity. The clothing should be supported from the shoulders and not from the waist, as any form of constriction around the lower abdomen exerts an injurious pressure and increases the congestion of the pelvic organs.

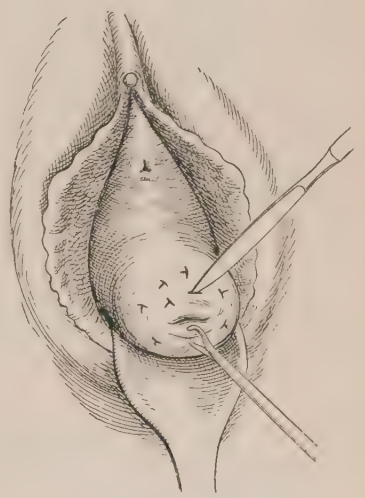


FIG. 429.—DEPLETING THE CERVIX WITH A BISTOURY.

The local treatment is an important factor in lessening the congestion. A vaginal douche of one or two gallons of hot normal salt solution should be used night and morning. Twice a week the vault of the vagina and the vaginal surface of the cervix should be painted with tincture of iodin and a cotton-wool tampon saturated with ichthyol and glycerin (25 per cent.) applied and left in position until the following morning, when it is removed by the patient before using the douche. Depleting the cervix by puncturing it with a bistoury is often followed by good results and should be employed in suitable cases once or twice a week when the iodin is applied.

The technic of this little operation is very simple. The patient is placed in the dorsal position and the cervix exposed by a speculum. The posterior lip of the cervix is then caught with bullet forceps and drawn toward the vulva. Multiple punctures are now made over the cervix with a narrow straight-pointed bistoury to the depth of from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch and the blade of the instrument withdrawn by a slight rotary motion in order to increase the size of the puncture. From one to two ounces of blood should be taken, and if the bleeding is sluggish a pledget of cotton saturated with *warm* water should be placed against the cervix. Should the bleeding continue after a sufficient amount of blood has been taken, it can readily be stopped by applying a pledget of cotton saturated with *hot* water and placing a gauze tampon against the cervix.

The Cure of the Disease.—This is accomplished by the removal of the diseased endometrium with a sharp curet. The operation is known as *Dilatation and Curetment* of the uterine cavity and its technic and after-treatment are fully discussed on page 955.

Special Directions.—The best time to perform the operation is during the intermenstrual period, when the monthly congestion of the pelvic organs is absent.

The uterine cavity should not be packed with gauze after the operation, as it interferes with free drainage and retains the discharges. There is never any danger of a severe primary or secondary hemorrhage occurring and the slight amount of bleeding which is present generally ceases within a few hours, although sometimes the hemorrhage may be rather profuse during the operation.

The patient should remain in bed for two weeks after the operation. While this is a longer period of time than is required after most cases of curetment, it is, however, necessary, as the congestion of the pelvic organs is greatly benefited by a prolonged rest in bed. In addition to the antiseptic douches that are employed in the after-treatment of curetment, vaginal injections should be given morning, noon, and night, consisting of two gallons of hot normal salt solution. These douches should be continued while the patient remains in bed, and subsequently they should be used every night and morning for three or four months.

Injurious Treatment.—The common practice of treating endometritis by making frequent caustic or alterative applications to the interior of the uterus is dangerous both to the health and the life of the patient, as septic inflammation is likely to result and produce grave tubal lesions. And, furthermore, such applications are utterly useless, as the disease involves the deep structures of the endometrium and can only be cured by removing the infected tissues with the curet.

Recurrence.—Sometimes the disease recurs after the operation of curetment and the patient is annoyed by a return of the leukorrhea and other symptoms. It may, therefore, be necessary to repeat the operation once or oftener as the case may be.

Constitutional Endometritis.

Definition.—A non-specific inflammation of the corporeal endometrium that is always subacute or chronic in character and which is primarily due to constitutional causes.

Pathology.—The disease presents itself in two varieties—*glandular and interstitial endometritis*. The endometrium seldom becomes hypertrophied and the fungoid or polypoid outgrowths which are a frequent complication in the congestive variety rarely occur in the constitutional form of the disease.

Causes.—The disease is due to constitutional conditions which cause a hypersecretion of the glands of the uterine cavity.

The chief causes are:

Tuberculosis.	Rheumatism.
Anemia.	Chloremia.
Scrofula.	Lithemia.
Gout.	Chlorosis.

Symptoms.—The disease is subacute from the beginning; its onset is very gradual; and patients cannot remember the exact time of the appearance of the leukorrhea.

The symptoms of the disease are caused by the pathologic changes in the endometrium, and, unlike the congestive form, there are no local lesions or

complications producing a separate group of pelvic symptoms which either mask or change the uterine signs of disease.

The following are the chief symptoms:

Leukorrhea.
Hemorrhage; Menstrual disturbances.
Pain.
Sterility and abortion.
General symptoms.

Leukorrhea.—Leukorrhea is the only constant symptom. The discharge is thin and serous in character and in some cases it is very profuse. It is without odor and non-irritating. As fungoid and polypoid outgrowths are rarely present in this variety of endometritis, the discharge is seldom purulent in character or mixed with blood. When the patient is uncleanly in her habits and the leukorrhea is profuse, the discharge may become decomposed and have an offensive smell. As a rule, the cervical mucosa is also involved and the secretions from the glands of the cervix as well as those from the vagina become mixed with the corporeal discharge. The leukorrhea is increased in amount for two or three days before and after the menstrual flow, and it is usually profuse in the glandular variety of endometritis or when the endometrium is hypertrophied.

Hemorrhage; Menstrual Disturbances.—These symptoms are rare. Menstruation may be accompanied by pain when the endometritis is caused by gout or rheumatism.

Pain.—This symptom is seldom present. When, however, the pathologic changes in the endometrium are marked there may be occipital or vertical headache, and pain may be felt in the hypogastric, the inguinal, or the lumbosacral region.

Sterility and Abortion.—As the structural changes in the endometrium are not so pronounced as in the congestive variety, there is, consequently, less tendency to sterility and abortion. On the other hand, however, conception may be prevented by the constitutional conditions causing the endometritis, and should pregnancy occur it may be interrupted by the depraved state of the patient's general health.

General Symptoms.—The character and the severity of the general symptoms depend usually upon the nature of the constitutional disorder. If the discharge is very profuse, which is not the rule, it may add to the already existing drain upon the patient's system, and thus increase the ill effects of the general disease.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The local and general physical signs.
The microscopic examination.

The History.—The history of the patient points to a constitutional disease which is a recognized cause of this variety of endometritis. The age of the patient, the fact of her being married or single, and her child-bearing history have no bearing upon the diagnosis, except so far as these conditions may enter into the etiology of the constitutional affection.

The Symptoms.—Leukorrhea is the only constant symptom. It is usually thin or serous in character and may at times be thick or viscid, although it is seldom purulent or mixed with blood. Hemorrhages, menstrual disturbances, and pain are usually absent, and the general symptoms are clearly traceable to a constitutional cause. The local pelvic symptoms which are due to the causative lesions and complications in congestive endometritis are entirely wanting.

The Local and General Physical Signs.—Local.—The patient is examined in the dorsal position. Vaginal touch and recto-abdominal and vagino-abdominal palpation show no appreciable change in the uterus unless the endometrium is the seat of polypoid or fungoid outgrowths, in which case the shape of the organ is rounder than normal, the cervix somewhat patulous, and the corporeal and cervical parenchyma more or less softened. These pathologic changes in the mucosa are very rare in the constitutional variety and can hardly be considered of any diagnostic value. The pelvic examination should be thorough so as to exclude all the lesions that may cause the congestive form of the disease. It should also be borne in mind that an endometritis may be both congestive and constitutional in origin and that a local lesion may be associated with a systemic disorder. This fact has an important bearing upon the treatment of these cases, and a cure cannot be accomplished until all the causes of the uterine inflammation are removed.

After completing the examination by touch a speculum is introduced into the vagina and the discharge is seen escaping from the external os uteri. The character of the discharge and the changes in its appearance caused by mixing with the secretions from the cervical canal and the vagina have already been referred to under congestive endometritis (p. 420).

General.—The local examination excludes the causes of congestive endometritis, and a careful investigation of all the organs of the body will usually reveal the nature of the constitutional origin of the uterine inflammation.

The Microscopic Examination.—If the uterine cavity is cureted to cure the disease the scrapings should be collected and sent to a pathologist for examination (see p. 38).

Prognosis.—The disease rarely causes pelvic complications unless improper local treatment is employed. (See congestive endometritis, p. 422.) The prognosis depends upon the curableness of the causative constitutional disease and the character of the uterine treatment.

Treatment.—The treatment is divided into:

The removal of the cause.

The cure of the disease.

The Removal of the Cause.—In the constitutional variety of the disease we must not lose sight of the fact that the general condition of the patient is primarily responsible for the pathologic changes in the endometrium, and hence our first effort must be directed toward correcting those vices of constitution to which we have referred in discussing the etiology of the disease, as it would be useless to attempt a cure by means of local treatment until this is accomplished. If, however, after the patient's general health has been restored the discharge still continues, it is an indication that the changes in the endometrium have become permanent and that the removal of the uterine mucosa by means of the curet is required to effect a cure.

The Cure of the Disease.—This is accomplished by the operation of *Dilatation and Curetment* of the uterine cavity.

Recurrence.—Sometimes the disease recurs after the curetment and it may be necessary to repeat the operation.

Gonorrheal Endometritis.

Definition.—A specific inflammation of the corporeal endometrium caused by the gonococcus of Neisser.

Causes.—The disease always begins in the cervix, either as a *primary* or a *secondary* infection. The former method of invasion is more frequent than the latter, and is caused by the direct infection of the intracervical mucosa by the penis coming in contact with the external os uteri. The affection, however, may be secondary at times to a gonorrheal inflammation in some other part of the genital tract, and as the vagina is the least likely situation for a specific infection owing to the resistant power of the vaginal epithelium against the invasion of pathogenic micro-organisms, it naturally follows that the cervical canal may frequently escape when the urethra and the vulva are primarily involved. On the other hand, however, the vagina may be primarily or secondarily involved, and, if it escapes altogether, the infection may be carried from the external organs to the os uteri either by the penis or the fingers of the patient.

While I fully believe in the theory of a latent gonorrhea in the male at times causing a specific endometritis years after the original attack, yet I cannot subscribe to the assertions made by Noeggerath and Tait as to the frequency of this cause of infection, for the reason that they are not borne out by the facts. The cases which are brought forward to uphold this theory show, in many instances, that post-puerperal infection and not gonorrhea was the cause of the pelvic lesion. It is also frequently impossible in chronic tubal disease to determine the nature of the infection, as gonorrheal endometritis is usually subacute or chronic in character from the beginning, and often attacks a woman and apparently passes away without the patient being aware of any local trouble. Furthermore in many cases of gonorrheal salpingitis the gonococci are not found when the contents of the tubes are examined; and, finally, how are we to explain the fact that such a vast number of marriages are followed by conception? Surely, if these authorities are correct in their views, sterility should be the rule and not the exception, as gonorrhea is, to say the least, a very common disease in men.

Symptoms.—The disease may be *acute* or *chronic*. As a rule, however, it is subacute or chronic from the beginning, but in exceptional cases it starts acutely with well-marked local and general symptoms. As the disease results from the extension of an inflammation in the intracervical mucosa, the symptoms of acute or chronic endocervicitis are always associated with it.

In the *chronic form* the onset of the disease is generally so insidious that the patient is not even aware of its presence, and the symptoms are identical with those caused by the simple forms of endometritis (*congestive* and *constitutional*) except that eventually the infection extends to the oviducts and signs of tubal disease present themselves.

When the disease begins *acutely*, it is ushered in by a chill followed by an elevated temperature and a rapid pulse. The patient complains of severe pelvic pain; nausea and vomiting; diarrhea; and rectal or vesical tenesmus, and in the course of a few hours a mucous discharge appears which rapidly becomes purulent in character and occasionally mixed with blood. The temperature is usually moderate and the chill is not severe, although it may be repeated several times. If the disease extends to the oviducts, symptoms of acute salpingitis and local peritonitis intervene, otherwise the acute manifestations gradually become less pronounced, and in the course of a few days the affection passes into the subacute or chronic stage.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.
The microscopic examination.

The History.—The history of the patient may at times aid in making the diagnosis. The woman may possibly admit having had a suspicious intercourse which was followed by a mucopurulent discharge from the vagina or by an increase in the amount or a change in the character of a leukorrhea that had existed previously. The history of an acute urethritis is strong presumptive evidence of gonorrhea, and the same is true of an acute endometritis not caused by sepsis, and of an acute attack of vulvitis when one or both of the vulvovaginal glands are involved. Sometimes it is possible to trace a gonorrheal infection occurring in a man to an apparently innocent discharge in a woman, and thus establish the nature of the leukorrhea. Unfortunately, however, as has been already stated, the onset of the disease is generally so insidious and its symptoms so chronic in character from the beginning that little or nothing can be elicited from the history of the patient pointing to the probable nature of the affection.

The Symptoms.—In the subacute or chronic form the symptoms are of no importance from a diagnostic standpoint, as they are identical with those caused by the simple forms of endometritis, unless the infection has extended to the oviducts and the subjective signs of salpingitis and localized pelvic peritonitis are present. Under these conditions we may suspect gonorrhea in a woman who has not borne children and who gives no history of a possible septic infection of the uterine cavity as the result of intrauterine treatment, the introduction of the uterine sound, or an operation upon the uterus. In the acute form of the disease, however, the local and general symptoms are sudden in their onset and always well marked, and unless some cause for septic infection is discovered by the history to account for the trouble, it is safe to assume the existence of a gonorrheal inflammation.

The Physical Signs.—These are studied by (*a*) touch and (*b*) sight. It is important to instruct the patient not to use a vaginal injection or to empty the bladder before presenting herself for examination, otherwise the discharges from the various parts of the genito-urinary tract will have been removed and a subsequent appointment made necessary.

T o u c h .—The patient is placed in the dorsal position and the examination made by vaginal touch combined with recto-abdominal and vagino-abdominal palpation.

In the acute form the uterus is found to be enlarged, somewhat softened, and very tender to the touch. The cervix is swollen, and its canal is more or less patulous and a circumscribed area of erosion is often felt surrounding the external os uteri. If the infection has extended to the oviducts, bimanual palpation will evoke severe pain and possibly also reveal some enlargement in their size.

In the chronic form of the disease there are usually no appreciable changes in the uterus unless the endometrium has become greatly hypertrophied or it is the seat of fungoid or polypoid outgrowths. Under these conditions the uterus is rounder than normal, the corporeal and cervical parenchyma is somewhat softened, and the canal of the cervix is more or less dilated. All of the pelvic organs should be carefully palpated so as to exclude or confirm the existence of tubal disease resulting from the extension of the infection in the endometrium. The presence of tubal involvement points to gonorrhea as the origin of the endometritis only in cases in which it occurs in women who have not borne children and who give no history of septic infection.

Sight.—The external and internal organs are examined by direct and indirect inspection. The examination must be systematically conducted and thorough, otherwise many important symptoms are likely to be overlooked.

There is nothing characteristic in the appearance of the discharge that will enable us to distinguish it from a leukorrhea caused by conditions other than gonorrhea. On the other hand, however, the coexistence of inflammation in parts of the genito-urinary tract that are seldom involved except by specific infection would strongly point to a gonorrheal origin of the uterine discharge. The presence, therefore, of signs of inflammation in the urethra; in Skene's glands or urethral ducts; or in the vulvovaginal glands is strong presumptive evidence of gonorrhea.

After the external organs have been inspected a speculum is introduced and the vagina carefully examined for signs of chronic inflammation. In cases of gonorrheal endometritis it is not uncommon to find circumscribed areas of inflammation on the posterior vaginal vault which are due to secondary infection from the uterus and are important evidence of the nature of the uterine disease.

In the chronic form the cervix is usually normal in appearance and a mucous or a mucopurulent discharge is seen escaping from the os uteri. In the acute variety, however, the cervix is swollen and congested and the os is surrounded by a circumscribed area of erosion. The discharge is generally profuse and purulent in character.

The Microscopic Examination.—The only positive evidence of the disease is the presence of gonococci in the tissues of the infected endometrium or in the discharges. If, however, the microscopic examination yields a negative result, we cannot say that the disease is non-specific, and, consequently, we must, if the case is a suspicious one, rely upon the clinical history and the physical signs to determine the nature of the affection. But even then it is often impossible to arrive at a probable conclusion, as the insidious onset of the disease and the absence of signs of infection in the urethra and in other suspicious parts of the genital tract may render any opinion utterly worthless. The gonococci may disappear from the discharges and remain indefinitely in the tissues of the endometrium, or they may vanish entirely and thus remove all positive evidence of the nature of the disease. This fact is well illustrated by the sterile character of the pus in cases of pyosalpinx of undoubted gonorrheal origin. Again, we should remember that the gonococci become more numerous and active during menstruation, and also just before and immediately after the period, than at any other time, and for this reason the discharges should be examined soon after the monthly flow ceases.

As dilatation and curetment of the uterine cavity are the treatment of gonorrheal endometritis, and should be performed at once whenever gonococci are found in the discharges or there is a suspicion of the inflammation being specific, it is, therefore, unnecessary to curet the uterus for the sole purpose of diagnosis, as the scrapings can be saved at the time of the operation and sent to a pathologist for examination.

Differential Diagnosis.—The **acute form** of the disease may be mistaken for *acute septic endometritis*. In the latter affection, however, the constitutional and local symptoms are usually more severe; the history shows a cause for the sepsis which may be post-puerperal in origin, or it may follow intrauterine treatment or an operation; the urethra, the glands of Skene, and the vulvovaginal glands are not involved; and, finally, gonococci are absent from the discharges. In acute gonorrheal endometritis, on the other hand, there is no history of septic infection, but there may be of a suspicious sexual intercourse;

there is usually coexisting inflammation in other parts of the genito-urinary tract; and gonococci may be present in the discharges.

The **chronic variety** of the disease may be mistaken for:

Congestive endometritis.
Chronic septic endometritis.
The lesions discussed in the differential diagnosis of congestive endometritis on page 421.

It is impossible at times to distinguish between the various forms of chronic endometritis with any degree of certainty. The gonorrheal origin of the disease may be suspected from the history of the case and from the coexistence of chronic inflammation in other parts of the genito-urinary tract. The presence of tubal disease excludes in all probability the congestive variety but not the septic, and if gonococci are found in the discharges or in the tissues of the endometrium the diagnosis is positive, but their absence is of little or no importance from a diagnostic standpoint.

In the congestive variety the onset of the disease is nearly always insidious and there is no history of septic or specific infection. The uterine appendages, as a rule, show no signs of disease, there are no coexisting foci of inflammation in other parts of the genito-urinary tract, and the physical examination generally reveals a cause for the congestion.

Septic endometritis presents a history of post-puerperal infection or of inflammation following intrauterine treatment or operation. Tubal disease is frequently present, but there is no involvement of the urethra, the glands of Skene, or the vulvovaginal glands.

Prognosis.—The disease is actively dangerous to life and health on account of the frequency with which it involves the oviducts and the peritoneum. The prognosis is influenced by the promptness and thoroughness of the local treatment, and the extent to which the periuterine structures are involved (*oviducts* and *peritoneum*). The disease may cause death in a short time or it may produce chronic tubal lesions and necessitate the removal of the uterine appendages to restore the patient to health. Gonorrheal endometritis is one of the most frequent causes of sterility in newly married women, and the disease often results from a latent gonorrhea in the husband which attacks the wife so insidiously that the only appreciable symptoms are sterility and a slight leukorrhea.

The uterine parenchyma is never the seat of abscesses or sloughing in this variety of endometritis.

Treatment.—The disease begins as a local condition and the treatment must be directed to the endometrium. Grave pelvic complications can only be prevented by prompt and effective action, which reduces to a minimum the chances of the infection extending to the oviducts.

This is accomplished by *Dilatation and Curetment* of the cervical canal and the uterine cavity. The technic and after-treatment of the operation are fully discussed on page 955. The operation removes the diseased and infected mucous membrane and at the same time destroys the specific micro-organisms and prevents the further spread of the inflammation.

Curetment must be performed at once if the endometrium becomes infected during the course of an acute attack of gonorrhea, and no time should be lost, under these circumstances, in temporizing or employing so-called conservative plans of treatment. The same indications for treatment are present in subacute or chronic cases in which the disease has existed for some time before the patient seeks advice. When the oviducts are involved, either in acute or chronic cases, the treatment is necessarily somewhat modified or altered to meet existing com-

plications. If the character of the tubal lesions requires the removal of the uterine appendages, the uterus should be cureted immediately before performing the abdominal section, unless the mobility of the pelvic organs is so restricted by adhesions that the operation cannot be done, in which case the curetment should be postponed until after the patient recovers from the graver operation.

Special Directions.—The best time to perform curetment in the subacute or chronic cases is during the intermenstrual period.

After the uterus is cureted and flushed with a solution of corrosive sublimate the uterine cavity is thoroughly swabbed with pure carbolic acid to completely destroy the micro-organisms and prevent reinfection.

The patient should remain in bed for one week after the operation.

Recurrence.—Sometimes the operation is followed by a recurrence of the disease, and it will therefore be necessary to repeat the curetment. When this happens, the curet findings and the discharge should again be examined microscopically.

Septic Endometritis.

Definition.—An inflammation of the endometrium due to septic micro-organisms, especially the *staphylococcus* and the *streptococcus;* the latter is seldom present except in puerperal cases.

Causes.—The disease is due to the invasion of the corporeal endometrium by septic micro-organisms, and, as the normal uterine cavity contains no germs, it follows that when infection occurs the pathologic bacteria are introduced into the uterus. In the vast majority of cases the disease is preventable, and is either due to ignorance or neglect upon the part of the attending physician or the result of a criminal abortion.

The following are the chief causes:

Infection following labor or abortion.
Intrauterine office treatment.
The use of the uterine sound.
Dirty operations.
Sloughing uterine tumors.

Infection following Labor or Abortion.—Post-puerperal infection is the most frequent cause of the disease, notwithstanding the brilliant results achieved by modern midwifery. In well-conducted maternity hospitals and among the upper classes the obstetrician obtains a very low percentage of infections, but in the working classes opposite conditions prevail, and it is often impossible even with the greatest care to avoid post-puerperal sepsis.

Frequent vaginal examinations during labor, the unnecessary use of the forceps, meddlesome manipulations during the second stage, the introduction of the hand into the uterus to detach the placenta, and the routine use of vaginal douches are often the cause of septic endometritis, and should therefore be avoided. Infection may also result from immediate operations for the repair of a lacerated cervix and from carrying pathogenic micro-organisms from the operating table to the bed of a woman in labor.

Septic endometritis following spontaneous and criminal abortions is so frequent that every practitioner has had more or less experience with this class of cases. The great danger in a spontaneous abortion is that it may not be complete and that the retained membranes may infect the uterine cavity. This is likewise a common complication in cases of induced abortion, and there is also the additional danger of infection occurring at the time the operation is performed.

Intrauterine Office Treatment.—The practice among some physicians of making local applications to the endometrium at their offices or at the patient's

home is dangerous both to health and life, and septic infection is eventually certain to result. Not only are alterative and sedative applications injurious, but they are also utterly useless as therapeutic measures, and should therefore never be employed.

The Use of the Uterine Sound.—The uterine sound should never be employed unless the patient is under the influence of an anesthetic and the vagina thoroughly sterilized (see p. 307).

The instrument has been responsible in the past for the death of a large number of women when it was generally employed in the diagnosis of uterine diseases and used by the gynecologist at his office without proper antiseptic precautions.

Dirty Operations.—Septic endometritis often results from the use of dirty instruments in performing operations upon the cervix or within the uterine cavity, and also from a general want of care in the antiseptic management of the after-treatment. The danger of pelvic complications following infection of the uterine mucosa must, therefore, always be borne in mind, otherwise the operator may look upon minor operations as being of but little importance surgically, and infect his patient.

Sloughing Uterine Tumors.—Sometimes sloughing may occur in a uterine polypus or in the inverted portion of the uterus in cases of inversion, and unless prompt operative measures are adopted a grave form of septic endometritis is likely to result which may be quickly followed by tubal involvement.

Symptoms.—The disease may be either *acute* or *chronic* in character. Usually, however, it begins acutely and subsequently passes into the chronic stage.

From a clinical standpoint *septicemia* is divided into two forms: (*a*) Septic intoxication, sapremia or putrid intoxication, which is caused by the absorption into the blood of ptomains that are the alkaloidal products of putrefaction or the toxins of the bacteria that are present; and (*b*) septic infection or true septicemia, which is caused by the absorption of bacteria into the blood, where they multiply rapidly and produce constitutional symptoms; toxins are also present. The difference, therefore, between sapremia and septicemia is that in the former the blood only contains toxins, while in the latter both bacteria and toxins are present.

Acute Variety.—Septic Intoxication.—The gravity of the symptoms depends upon the dose of the poison absorbed into the blood. The toxins do not increase in quantity after they enter the blood, and consequently the amount absorbed from time to time depends upon the condition of the putrefying areas, which is always more or less modified by local treatment.

The symptoms usually manifest themselves within twenty-four or forty-eight hours after labor or after an intrauterine operation. They are ushered in by a severe chill, which is followed by a high temperature and a rapid pulse. In a few hours the lochial discharge is diminished in quantity or temporarily suppressed; but it returns again in a short time and is very dark in color, purulent in character, and has a very offensive, putrid odor. The patient suffers almost from the beginning with intermittent uterine pains which soon become continuous and very acute. As the disease advances all the symptoms become exaggerated. The chills recur irregularly, the temperature is very high, often reaching 104° to 105° F., the pulse is weak and rapid, the urine is suppressed or diminished in quantity, diarrhea sets in, and if the case passes from bad to worse symptoms of the typhoid state develop and the patient gradually grows weaker until death finally ensues.

The chills are very irregular in their recurrence; they may occur several

times in the course of twenty-four hours, or they may be entirely absent after the initial rigor; or, again, they may recur two or three times during the progress of the disease. The temperature becomes very high immediately after each chill, and it may either remain elevated with slight remissions or it may drop several degrees in the course of a few hours. There is nothing characteristic in the fever curve except its irregular remissions and its tendency to remain elevated. As a rule, the temperature reaches a very high elevation immediately before death takes place.

Septic Infection.—The gravity of the disease and the severity of the symptoms depend upon the extent and the rapidity with which the bacteria increase in the blood.

The symptoms usually manifest themselves in from four days to one week after labor or after an intrauterine operation. The disease begins, as a rule, with fever and a rapid pulse. Sometimes the onset is marked by a chill, but usually it is absent or it may occur later in the course of the infection. The pulse is not rapid in the beginning, but as the disease progresses it gradually increases in frequency and eventually becomes very compressible and weak. As a rule, the elevation of the temperature is not marked at first, but if the disease continues unchecked it may finally become very high. It often shows an evening exacerbation and a morning remission, but generally the fever curve is irregular and uncertain. As the disease advances gastro-intestinal disturbances present themselves and the patient suffers with vomiting and diarrhea. Profound exhaustion characterizes the affection. If the source of the infection is not destroyed or the poison is not eliminated from the blood, the case gradually goes from bad to worse, until finally symptoms of the typhoid state develop and death takes place.

Chronic Variety.—When the acute forms do not end in death, the symptoms gradually subside and the disease eventually becomes chronic in character. The symptoms do not differ very materially from those caused by the chronic forms of simple endometritis—*congestive* and *constitutional.*

The following are the chief symptoms:

Leukorrhea.
Hemorrhage; Menstrual disturbances.
Pain.
Sterility and abortion.
General symptoms.

Leukorrhea.—This symptom is constant. The discharge is more or less profuse and always purulent in character, indicating the presence of pyogenic cocci in the uterus. Occasionally the discharge is mixed with blood which is due to fungoid and polypoid outgrowths which develop from the mucosa in chronic forms of endometritis. The secretion is usually odorless unless the patient is uncleanly in her habits, when it becomes offensive from retention and decomposition in the vagina. The intracervical mucosa is, as a rule, also affected, and the secretions from the glands of the cervix as well as from the vagina become mixed with the uterine discharge. The leukorrhea is more profuse just before and immediately after menstruation.

Hemorrhage; Menstrual Disturbances.—Uterine hemorrhages are rare unless the uterus has not been entirely emptied of the products of conception. Menstruation, however, is frequently profuse in amount and longer in duration than normal, owing to the pathologic alterations in the endometrium.

Pain.—There is seldom any pain in the uterus itself, but the associated tubal and periuterine inflammation which so frequently results from the septic

forms of endometritis causes more or less pelvic tenderness and distress. These symptoms may be constant or they may be noticeable only when the patient exerts herself. In some cases the inflammation of the mucosa may produce reflex vertical or occipital headache, or, again, there may be pain in the lumbosacral, inguinal, or hypogastric region, and in some instances the patient may complain of a burning sensation behind the symphysis pubis.

Sterility and Abortion.—Sterility is very likely to result from the septic infection in the uterus extending to the oviducts and causing a destructive lesion that permanently obliterates them. Even if the tubes are not involved conception is not likely to occur, as the pathologic changes in the endometrium are usually of such a character that it no longer offers a suitable attachment for the ovum. Furthermore if conception does take place abortion is likely to follow, as the diseased mucous membrane may not be able to undergo the necessary changes of pregnancy, and, finally, the altered character of the uterine secretions is more or less destructive to the activity of the spermatozoa.

General Symptoms.—The general symptoms are seldom well marked, and in some cases there is no systemic disturbance whatever, unless the discharge becomes very profuse and exhausts the patient. Unfortunately, however, the associated pelvic lesions frequently impair the general health and cause debility and nervous exhaustion. These patients suffer with gastro-intestinal disturbances, loss of appetite, and local discomfort, and are unable, as a rule, to perform the ordinary duties of life.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.
The microscopic examination.

The History.—In the *acute variety* the history points directly to infection, and hence the diagnosis should not be difficult. In the *chronic form*, however, the statements of the patient cannot always be relied upon and the original cause may therefore be difficult or impossible to determine. On the other hand, when a patient who is suffering from a purulent discharge from the uterus gives a history of post-puerperal or some other form of septic infection, it is fair to assume that the case is one of endometritis caused by pyogenic cocci.

The Symptoms.—In the *acute variety* the general and local symptoms appear suddenly and are associated with an elevated temperature and a high pulse-rate. The systemic disturbances are well marked and indicate a more or less profound general infection.

In the *chronic form* the purulent discharge from the uterus is the only significant symptom that is constantly present. Menstrual irregularities and uterine hemorrhages are present in other pathologic conditions and are therefore of no particular aid in making the diagnosis; the same is true of the reflex pains and the general symptoms. Local pelvic pain caused by tubal or periuterine lesions indicates either a septic or gonorrheal origin of the disease.

The Physical Signs.—These are studied by (*a*) touch and (*b*) sight.

Touch.—The examination is made by vaginal touch combined with abdominal palpation.

In the *acute variety* following labor at or near term the uterus and cervix are found to be relaxed, soft, and flabby; the normal contraction of the organ is absent and involution is retarded or checked; the temperature of the parts is elevated; the vagina is moist and filled with the lochial discharge and purulent secretions; the os uteri is patulous and there may be evidences of a recent traumatism; and the body and fundus of the uterus are enlarged and tender to

the touch on account of the septic metritis which is often present. If the inflammation has extended to the oviducts, bimanual palpation will elicit pain and possibly some enlargement. In *non-puerperal* cases the uterus is slightly enlarged, softer than normal, and tender to the touch. The os uteri is patulous; the cervix is swollen and soft; the temperature of the parts is raised; and the vagina is moist and bathed with a profuse purulent discharge. A bimanual examination reveals the presence or absence of tubal involvement.

In the *chronic form* the physical signs do not differ from those that are present in other varieties of endometritis. The uterus is slightly enlarged; its body is somewhat rounded; the consistency of the entire organ is softer than normal; and the vagina is moistened with a purulent discharge. Bimanual palpation does not elicit pain, as a rule, unless the uterine appendages are involved.

Sight.—In *post-puerperal* cases the external organs, the vagina, and the cervix are bathed with a purulent discharge mixed with the lochia. The os uteri is patulous and the characteristic secretion is seen escaping from the mouth of the cervical canal. Diphtheric deposits or gangrenous areas may sometimes be seen upon the external organs, the vagina, and the cervix. In *non-puerperal* cases the characteristic discharge is seen escaping from the os uteri and bathing the parts below. Sometimes the cervix is eroded and presents a very angry and inflamed appearance from the constant irritation produced by the altered secretions.

In the *chronic form* the discharge is the only diagnostic sign. If the leukorrhea is profuse and irritating, the cervix may be eroded and somewhat inflamed.

The Microscopic Examination.—In post-puerperal septic endometritis the diagnosis can usually be made without resorting to a microscopic examination of the discharges. But if for any reason it is desirable to know the exact nature of the infection, such an examination should be made; the same is true in non-puerperal and chronic cases.

Differential Diagnosis.—The *acute form* of the disease may be mistaken for acute gonorrheal endometritis. In the latter affection there is no history of septic infection, but there may be of a suspicious sexual intercourse; there is usually coexisting inflammation in other parts of the genito-urinary tract, and gonococci may be found in the discharges. In acute septic endometritis, on the other hand, the constitutional and local symptoms are more severe; the history shows a cause; the urethra, the glands of Skene, and the vulvovaginal glands are not involved, and, finally, staphylococci or streptococci or both are found in the discharges.

The *chronic variety* of the disease may be mistaken for the following lesions:

The simple forms of endometritis.

Chronic gonorrheal endometritis.

The affections discussed in the differential diagnosis of congestive endometritis on page 421.

The simple forms of endometritis are insidious in their origin and there is no history of a remote septic infection. The uterine appendages, as a rule, are not affected and the leukorrheal discharge is non-purulent in character, whereas it is always purulent in the septic variety.

The gonorrheal form of endometritis can only be distinguished from the septic by a microscopic examination.

Prognosis.—The disease is actively dangerous to life and health on account of the frequency with which the inflammation spreads to the oviducts and the peritoneum. The parenchyma of the uterus may also be involved, producing a septic metritis which is often complicated by sloughing and multiple abscesses,

and which may involve the serous coat of the organ and cause a fatal peritonitis.

The prognosis depends upon the promptness and thoroughness of the local treatment; the extent to which the inflammation has spread; and the cause and nature of the infection. In the beginning of the attack prompt and radical measures often succeed in limiting the disease to the endometrium and preventing its extension to adjacent structures. But after the parenchyma of the uterus or the oviducts has become involved the outlook is exceedingly grave, and the life or future health of the patient is in imminent danger. Infection occurring in the parturient woman is always more serious than when it occurs in the non-puerperal state, and sterility is a common sequence of the disease.

Treatment.—The disease begins as a local condition and the treatment must be directed to the endometrium.

The treatment of the affection is discussed under the following headings:

Acute puerperal cases.
Acute non-puerperal cases.
Chronic cases.
Complicated cases.

Acute Puerperal Cases.—In septic cases following premature labor the uterine cavity is irrigated three times during the first twenty-four hours with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution. If at the end of that time the symptoms have abated, the irrigation is continued twice a day for several days. Should, however, the symptoms at the end of the first twenty-four hours show no marked signs of improvement, the uterus must be cureted. It is often necessary to resort to curetment at the start and not wait for possible results from the use of intrauterine douches in cases in which the constitutional symptoms are severe and indicate a large local area of infection or when the physician suspects that the uterine cavity is occupied by retained material. As a general rule, possibly it is safer to curet at once and then use the uterine douches, as there is danger of the infection spreading when less radical means are employed during the first twenty-four hours. The judgment of the attending physician and the special symptoms which are present must naturally determine the course to pursue in an individual case, and it is therefore impossible to recommend a positive rule of action.

Technic of Puerperal Curetment.—*Position of the Patient.*—The patient is placed crosswise on the bed or on a kitchen table and her hips supported on a surgical pad.

Anesthesia.—A general anesthetic is indicated, and should always be employed except when the patient is weak or exhausted.

Sterilization of the Patient.—The vagina and vulva are douched with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and the parts dried with a gauze sponge.

Dressings and Sponges.—Three dozen gauze sponges; a vulvar compress; a gauze tampon; and a T-bandage.

Irrigating Apparatus and Solutions.—The irrigating apparatus is described and shown on page 94. The solutions consist of corrosive sublimate (1 to 2000) and normal salt solution.

Instruments.—(1) Simon's speculum (curved blade); (2) two bullet forceps; (3) dressing forceps; (4) large curet; (5) curet forceps; (6) scissors.

Operation.—The uterus is irrigated with a solution of corrosive sublimate (1 to 2000) and its cavity explored with the index and middle fingers of the left

hand, while the right hand makes counter-pressure externally. All large masses

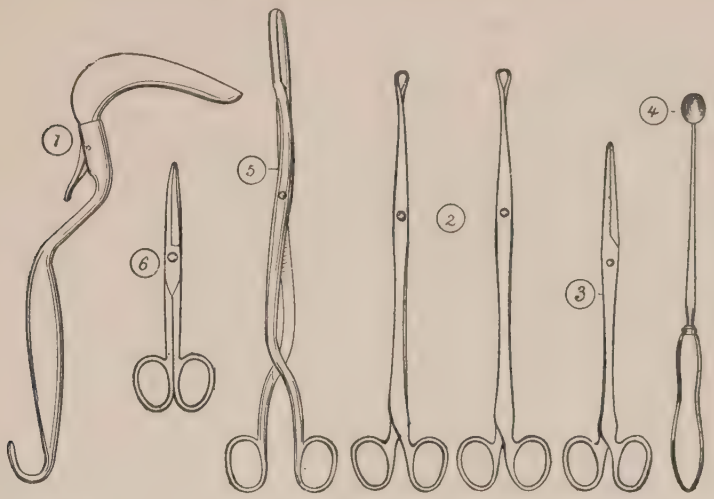


FIG. 430.—INSTRUMENTS USED IN THE OPERATION OF CURETMENT OF THE UTERUS FOR ACUTE SEPTIC ENDOMETRITIS.

of material are carefully separated and removed with the fingers from the uterine cavity. Simon's speculum is now introduced into the vagina and the anterior and posterior lips of the cervix seized by bullet forceps. The cavity of the uterus is again irrigated and then cureted with the large curet and the curet forceps. It is then flushed, the speculum withdrawn, and the uterus again explored with the fingers to determine whether or not its cavity has been entirely cleaned. If it is found that any foreign material remains, the cureting instruments are again employed, and the uterus finally irrigated with a hot solution of corrosive sublimate (1 to 2000), followed by a quart of hot normal salt solution. The vagina is then dried with gauze sponges and the vulva protected with a gauze compress held in position by a T-bandage.

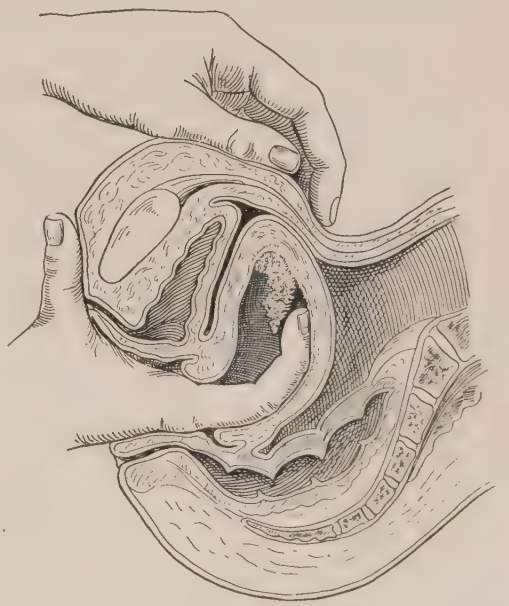


FIG. 431.—CURETMENT OF THE UTERUS FOR ACUTE SEPTIC ENDOMETRITIS.

Showing the removal of retained placental tissue with the index-finger.

After-treatment.—As the uterine cavity is not packed with gauze

after the curetment the drainage is free and unobstructed, consequently further attention to the uterus is unnecessary unless the subsequent symptoms indicate a continuation or return of the septic process. The vagina is irrigated twice a day with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution; the irrigation is continued for one week and then stopped if the condition of the patient is normal.

If the temperature or pulse keep up after the operation, the uterine cavity should be irrigated once or twice a day, and in some cases it may be necessary to repeat the curetment a second or third time.

Septic endometritis following an abortion during the first half of pregnancy is treated by dilatation and curetment of the uterus, as described on page 955.

Acute Non-puerperal Cases.—These cases are treated by dilatation and curetment of the uterus (see p. 955).

Chronic Cases.—The treatment is dilatation and curetment of the uterus (see p. 955).

Complicated Cases.—These cases include those in which the infection has extended beyond the endometrium and involves the uterine parenchyma, the periuterine tissues, or the oviducts.

I have never met an uncomplicated case of suppurative inflammation of the uterine parenchyma following labor, either upon the operating table or at a postmortem examination, and those which I have seen were associated with pus accumulations in the uterine appendages or in the connective tissues of the pelvis. The reason for this is probably due to the fact that the septic infection extends to the periuterine structures before the necessity for operative interference is appreciated or death takes place. It is impossible to determine positively in an individual case whether or not the parenchyma is the seat of infection, and our only guide is the result of local treatment. Thus, if a case goes from bad to worse after repeated curetments and flushings, we are justified in believing that the parenchyma is involved unless a gross lesion of the appendages or the periuterine tissues is discovered. I admit, as a matter of course, the extreme uncertainty of the existence of an uncomplicated septic infection of the parenchyma of the uterus; yet we must all recognize the fact that when the endometrium is the seat of an acute disease the tissues beneath the mucosa must sooner or later become involved unless the morbid process is arrested. When the parenchyma is the seat of septic infection or of multiple abscesses, abdominal hysterectomy is indicated. We must, however, be fully justified in our opinion that the infection has involved the muscular wall of the uterus before resorting to the operation, as a mistake in the diagnosis will not only result in the unnecessary removal of an important organ, but it will also lessen the chances of recovery. It often requires, therefore, the greatest diagnostic skill and judgment on the part of a surgeon to know precisely what to advise. Again, it is often best to postpone the operation until the patient's condition improves and warrants the resort to operative interference. If the patient is in a condition of profound septic prostration, with a high temperature and a feeble and rapid pulse, she has a much better chance of ultimate recovery by deferring the operation until she is able to stand the shock of a grave procedure like a hysterectomy. This is especially true if the disease has lasted for several days, because it shows that the absorption of septic material into the system is slow and that nature is

endeavoring to shut off the area of infection, and any interference involving the slightest shock might weigh the balance in favor of death and rob the patient of her only chance of recovery. When the broad ligaments are involved and abscess formations occur, the pus should be evacuated through the vault of the vagina. This is a much safer route than the abdominal, under the circumstances, as the patient is not usually in a condition during the puerperium to stand the shock of a radical operation, which may be performed later if required.

It is extremely difficult, if not impossible, to recognize septic changes in the oviducts before the disease has developed sufficiently to cause an enlargement, and under these circumstances, therefore, the indications for their removal are not clear. When a gross lesion develops in one or both of the Fallopian tubes during the puerperium, a careful examination should be made of the patient's general condition and the same principles applied which govern the treatment of an infection involving the uterine parenchyma.

Senile Endometritis.

Definition.—An atrophic form of endometritis occurring in old women that is characterized by a thin purulent discharge which is often stained with blood and is exceedingly irritating to the parts.

Pathologic Changes.—The endometrium and its glandular elements become atrophied and are more or less completely replaced by a connective-tissue membrane. There is often an atresia or a stenosis of the uterine cavity from its walls growing together, which is more common at the internal os than at any other part of the canal, and when the occlusion is complete the retained secretions distend the uterus, forming a cyst-like tumor, which is known as a *senile* pyometra or hydrometra.

Causes.—The disease occurs after the menopause and is known as "*post-climacteric endometritis*." It is usually the result of an old or a new infection on the atrophying mucosa which has less resistance than normal on account of the retrograde changes which are taking place, and consequently it is more susceptible to morbid influences.

Symptoms.—The disease develops more or less gradually after the menopause. Leukorrhea is the most constant and characteristic symptom. It is usually profuse, offensive, and purulent, and in some cases stained with blood. As a rule, it is very irritating in character and frequently causes an intense pruritus vulvæ, and there may be a monthly increase in the quantity of the discharge corresponding in time to the former periods of menstruation. Slight hemorrhages may occur in rare cases from the rupture of small vessels in ulcerated areas.

These patients, as a rule, are not well nourished, but there are usually no special reflex or general symptoms present unless the secretions become retained within the uterine cavity from atresia of the internal os. Under these circumstances the patient complains of a dull pain in the lumbosacral region and lower abdomen, loss of appetite and strength, and a feeling of mental depression. If the retained secretions become infected, symptoms of a mild form of slow sepsis develop which are marked by a slight rise in the temperature and pulse, occasional sweats, and great physical prostration.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.
The microscopic examination.

The History.—The age of the patient and the fact that she has passed the menopause are in favor of senile endometritis. This opinion is still further strengthened if there is no history of a leukorrheal discharge until after the climacteric. We must, however, bear in mind the fact that the affection may be caused by an old infection, and that an endometritis existing prior to the change of life may afterward become atrophic in character.

The Symptoms.—The leukorrheal discharge is the only symptom that is at all significant. If it is stained with blood or is associated with a slight hemorrhage, the indications are in favor of the presence of malignant disease, and the microscope must be used to settle the diagnosis. When the secretions are retained and become infected, the symptoms are of no value without a physical examination, as they simply point to general sepsis.

The Physical Signs.—The physical signs are studied by (*a*) touch and (*b*) sight.

T o u c h .—The patient is placed in the dorsal position and the examination made by *vaginal touch* combined with *vagino-abdominal palpation.*

The usual atrophic changes are present. The fundus and body of the uterus are undersized and the cervix is more or less atrophied. If atresia of the uterine canal exists and the secretions are retained, the signs of distention are present and readily determined by combined touch.

S i g h t .—The speculum reveals the origin and character of the discharge which is seen escaping from the mouth of the uterus. If the patient is suffering from pruritus vulvæ, the local manifestations of the affection will be seen upon the external organs.

The Microscopic Examination.—The diagnosis is based upon the results of the microscopic examination of the curet findings which are secured when the uterine cavity is cureted to cure the disease.

Differential Diagnosis.—The disease may be mistaken for cancer of the uterus. The differential diagnosis depends upon the results of a microscopic examination.

Prognosis.—A spontaneous cure may occur if ulcerative adhesions take place and the cavity of the uterus becomes obliterated. This result, however, is rare and the suppurative discharge, as a rule, continues indefinitely, unless cured by appropriate treatment.

The disease is readily cured by operation.

Treatment.—The treatment consists in dilating the uterus and removing the entire endometrium with a sharp curet. (See Dilatation and Curetment of the Uterus p. 955.)

Special Directions.—After the uterine cavity has been cureted and flushed, the denuded surface is cauterized with pure nitric or carbolic acid, care being taken to protect the vagina by packing gauze around the cervix. The uterus is then irrigated with an alkaline solution and the operation completed in the usual manner.

ENDOCERVICITIS.

Synonyms.—Cervical catarrh; Cervical endometritis.

Definition.—An inflammation of the intracervical mucous membrane.

Causes.—Inflammation of the intracervical mucous membrane may occur either as a *primary* or *secondary* infection. The former is due to direct invasion of the mucosa by septic or specific germs. Gonorrhea frequently attacks the cervical canal as a primary infection without involving other parts in the beginning, and the same is true of septic inflammation resulting from the use of dirty

instruments, etc. Secondary infection results from extension upward from the vagina and downward from the uterine cavity; the latter source, however, is very rare.

The relations existing between the cervix and vagina especially expose the cervical canal to various forms of infection. Again, as the canal is usually occupied by germs, the slightest alteration in the normal condition of the parts, such as congestion or traumatism, causes the bacteria to multiply rapidly and become pathogenic. Furthermore, when infection occurs it is very difficult to dislodge, as the germs occupy the glandular crypts and remain there in a more or less active or a latent condition. And, finally, the internal os uteri may act as a barrier to the spread of the inflammation into the uterine cavity, and hence a chronic infection of the cervix at times remains localized unless the disease is carried into the uterus by a sound or some other mechanic means.

The exciting causes of endocervicitis are the same as those of endometritis, and I shall, therefore, classify them as follows:

Congestive causes (see Congestive Endometritis, p. 418).
Constitutional causes (see Constitutional Endometritis, p. 424).
Gonorrheal infection (see Gonorrheal Endometritis, p. 427).
Septic infection (see Septic Endometritis, p. 431).

It is unnecessary to repeat again what has already been fully discussed under the causes of the different varieties of endometritis, yet it will, however, not be improper or useless to refer briefly to the frequency with which the traumatisms of labor act as causative lesions. As stated elsewhere, one of the pathologic changes which results from a deep bilateral laceration is an eversion of the lips of the cervix which occurs sooner or later in the majority of instances. When the lips are thus everted, the intracervical mucous membrane is naturally exposed and is subjected not only to infection, but also to irritation from contact with the vaginal walls. As a result, inflammatory changes develop, the cervix becomes eroded and hypertrophied, and cystic degeneration occurs.

Symptoms.—Leukorrhea is the only distinctive symptom of endocervicitis. The discharge is clear, thick, and tenacious, like the white of egg, and at times very profuse. When the inflammation is suppurative in character, the secretion becomes opaque in color and creamy in consistency from the presence of pus cells. Other symptoms which may be present at times are not due to the local disease, but to its causative lesions or to an extension of the inflammation to adjacent structures, such as the endometrium of the uterine cavity and the oviducts or peritoneum.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.
The microscopic examination.

The History.—A careful inquiry should be made as to the cause of the discharge, which may be traced to a gonorrheal or septic infection in some cases, and in others the history may show a congestive or constitutional origin.

The Symptoms.—Leukorrhea is the only constant symptom, and if the discharge is not mixed with pus its origin is readily determined by the character of the secretion, which, as stated above, is clear and tenacious, like the white of egg.

The Physical Signs.—The physical signs are studied by (*a*) touch and (*b*) sight.

T o u c h .—The patient is placed in the dorsal position and the examination made by *vaginal* and *vagino-abdominal palpation.*

In uncomplicated cases of endocervicitis the intravaginal portion of the cervix

is slightly swollen and soft to the touch. The os is more or less patulous and a circumscribed area of erosion is often felt surrounding it. In multiparous women the disease is usually associated with a laceration of the cervix, and hence the characteristic physical signs are wanting and the pathologic changes dependent upon the traumatism are easily recognized by the examiner's finger.

A thorough examination should be made of the position of the uterus and the condition of the uterine appendages in order to complete the investigation and confirm the diagnosis.

Sight.—The speculum reveals the origin and character of the discharge, which is seen escaping from the external os; the area of erosion; the patulous condition of the os uteri; and the congested appearance of the cervix. If the cervix is lacerated, the characteristic pathologic changes are observed and the extent of the tear ascertained.

The Microscopic Examination.—The diagnosis is based upon the results of the microscopic examination of curet findings or glass slide smears.

Differential Diagnosis.—The differential diagnosis depends upon determining the source of the discharge. This is rarely possible, as endometritis is usually associated with endocervicitis; and besides it is of no practical value to distinguish between the two conditions, as the treatment is the same for both.

A discharge from the Fallopian tubes may be mistaken for endocervicitis when the distinctive character of the cervical secretion is altered by pus cells. (See Congestive Endometritis, p. 421.)

Prognosis.—Endocervicitis of gonorrheal or septic origin is actively dangerous to life on account of the tendency of the infection to spread to the corporeal endometrium and the oviducts. Gonorrheal endocervicitis is often very chronic in its course and may remain localized in a latent state for an indefinite period, causing infection in the male or acute septic symptoms during the puerperium.

Endocervicitis arising from congestion or constitutional causes seldom results in tubal disease, and hence the prognosis is always favorable to life.

All forms of endocervicitis are very chronic in their course and show little or no tendency toward a spontaneous cure.

Treatment.—It is impossible from the standpoint of treatment to separate endocervicitis and endometritis. The two conditions are usually associated and the same principles of treatment apply to both. Local applications to the intracervical mucosa alone are dangerous because the infection may be carried to the corporeal endometrium, and they are useless because the disease lurks in the glandular crypts and is unaffected by the medication.

The treatment, which is based upon the cause, and which is the same as for endometritis, is carried out as follows:

Congestive in origin (see Congestive Endometritis, p. 422).
Constitutional in origin (see Constitutional Endometritis, p. 426).
Gonorrheal in origin (see Gonorrheal Endometritis, p. 430).
Septic in origin (see Chronic Septic Endometritis, p. 436).

Whenever curetment is indicated, the procedure should include the cavity of the uterus, otherwise the operative results are unsatisfactory and the cure uncertain, as the inflammation has usually extended beyond the internal os uteri.

SUBINVOLUTION OF THE UTERUS.

Definition.—An arrest of the physiologic process of involution which takes place in the uterus after labor or abortion and by means of which the organ returns to its normal size and weight.

Pathologic Changes.—When involution is arrested, fatty degeneration and absorption of the muscular and connective tissues of the uterus do not take place, and the organ remains hypertrophied for an indefinite length of time.

The hypertrophy may be limited to the body of the uterus or the cervix, but, as a rule, the entire organ is involved, and it is symmetrically enlarged and heavy. The uterine walls are thick and soft; the cavity is often increased in length to four inches or more; and the endometrium is congested and swollen. The uterine ligaments are also subinvoluted and remain abnormally thickened and elongated. The blood-vessels remain increased in number and size and the pelvic organs are in a state of passive congestion. The heavy uterus, unsupported by its ligaments, gradually sinks lower and lower in the pelvic cavity, and its fundus eventually becomes retrodisplaced.

Causes.—The causes are always puerperal in origin and classified as follows:

Septic or specific infection.
Laceration of the cervix.
Uterine displacements.

Septic or Specific Infection.—Infection of the uterus during the puerperal state arrests involution at once, and if the disease is not checked the organ becomes subinvoluted. This is a very common primary cause of the affection, and as the result of the increased size and weight of the uterus a retrodisplacement usually occurs when the patient gets out of bed.

Laceration of the Cervix.—A cervical tear interferes with the retrograde changes that are necessary to restore the uterus to its normal size, and hence it is a primary cause of subinvolution, which eventually results in some form of uterine displacement.

Uterine Displacements.—A prolapse or a retrodisplacement of the uterus is a primary cause of subinvolution. So long as the uterus remains at its normal level in the pelvic cavity the venous flow of blood is unimpeded in its course and involution progresses normally, but when the organ sinks below this point the vessels become stretched and kinked, the circulation is obstructed, and the resulting congestion interferes with the absorption of the products of fatty degeneration.

A uterine displacement may develop during the puerperium from the following causes:

Septic or specific infection.
Laceration of the cervix.
Laceration of the perineum.
Getting out of bed too soon after delivery.
Lying constantly upon the back and the use of a tight bandage after labor.

The first two of these causes have already been discussed.

A laceration of the perineum interferes with the balance of power in the mechanism of uterine support and may become a cause of uterine displacement (see p. 319).

Getting out of bed too soon after a labor or an abortion also results in prolapse or retrodisplacement because the uterus at that time is too heavy for its ligaments, and hence they become overstretched and allow the organ to fall backward and downward.

Lying constantly upon the back and the use of a tight bandage after labor are common causes of uterine displacement, and cannot, therefore, be too earnestly condemned. Under these conditions the heavy, enlarged, and softened uterus is acted upon by specific gravity and gradually falls backward because its ligaments

for some time after labor are so elongated that their function as tether-ropes is temporarily lost.

Symptoms.—The symptoms are divided into:

Local symptoms.
General symptoms.
Symptoms caused by coexisting pathologic conditions.

Local Symptoms.—The local symptoms are lumbosacral pain and a bearing-down sensation or weight in the pelvis. The menstrual flow is increased in amount and there is a more or less profuse leukorrheal discharge.

General Symptoms.—There is usually some gastro-intestinal disturbance, which is manifested by loss of appetite and constipation, and, as a rule, the patient suffers from vertical or occipital headache. The general health is frequently impaired; the blood becomes anemic; there is loss of strength and weight; and eventually symptoms of neurasthenia are developed.

Symptoms Caused by Coexisting Pathologic Conditions.—These symptoms are due to uterine displacements and lacerations of the cervix or perineum, and are fully discussed under their respective headings.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.

The History.—Valuable information is often obtained from the statements of the patient. She may give a history of good health up to her last confinement, which may have been instrumental and followed by a slow and unsatisfactory convalescence with subsequent symptoms pointing to subinvolution. Again, there may have been a septic infection or a displacement may have resulted from lying upon the back too long after labor, or from getting up too soon after confinement; and while these statements do not lead to a conclusive opinion, yet they assist materially in forming a correct diagnosis when considered in connection with the symptoms and physical signs.

The Symptoms.—Taken alone, the symptoms are not characteristic; but when studied in connection with the patient's history and the physical signs, they become important as an additional link in the chain of evidence. Thus, if the local and general symptoms of subinvolution are present and the statements of the patient point to a cause, we are justified, all things being equal, in attributing the enlarged and softened uterus to an arrest of involution.

The Physical Signs.—The patient is placed in the dorsal position and examined by (*a*) touch and (*b*) sight.

T o u c h .—The examination is made by *vaginal touch* and by *vagino-abdominal palpation.*

The uterus is equally enlarged in all directions; it is not tender to the touch; its walls are softer than normal; and if a sound is introduced the length of the cavity is found to be increased. The cervix, as a rule, is not much involved, and may therefore be only slightly hypertrophied. The uterus may be found displaced and the cervix and perineum torn. A careful palpation should be made of the uterine appendages to exclude the existence of a tubo-ovarian lesion.

S i g h t .—The perineum and lower part of the vagina are carefully inspected to determine the absence or presence of lacerations. The condition of the cervix and the origin of the leukorrheal discharge are revealed by a speculum examination. The cervix may or may not be lacerated and the uterine secretions are often seen escaping through the os uteri.

Prognosis.—The results of treatment depend upon the changes which have taken place in the uterine structures, and if the affection has not become

chronic a cure can usually be expected, but if the mucous membrane has undergone permanent thickening and hyperplasia of the connective tissue has taken place in the muscular structures, the disease will not be materially benefited by any form of treatment.

Treatment.—The enlarged uterus and the coexisting endometritis are constant lesions of subinvolution, and hence they always require treatment independently of the cause or the associated pathologic conditions.

In a case of subinvolution in which no cause remains or in which no associated pathologic condition exists the treatment is directed solely to the cure of the enlarged uterus and the endometritis. But when the disease is associated with a retrodisplaced uterus or a lacerated cervix or perineum, no curative result will follow the treatment unless these lesions, which are either the primary cause of the affection or have become secondary causes, are cured along with the structural changes in the organ. For example, in a case of subinvolution of the uterus associated with retrodisplacement we must first dilate and curet the uterine cavity and at the same time restore the organ to its normal position and keep it there with a pessary or by performing the operation of ventral suspension. When the patient has recovered from the abdominal operation, or at once in a recent case if a pessary has been inserted into the vagina, she should be treated locally and generally for the enlargement of the uterus, which, now that the cause (*retrodisplacement*) has been removed and the endometritis cured, can usually be accomplished.

The indications therefore in the treatment of subinvolution are:

To cure the coexisting endometritis.

To reduce the size of the uterus.

To remove the cause and associated pathologic lesions.

To Cure the Endometritis.—This is accomplished by the operation of dilatation and curetment of the uterus, which is fully described on page 955.

To Reduce the Size of the Uterus.—This is accomplished as follows by:

Local treatment.

General treatment.

Local Treatment.—The patient should douche the vagina night and morning, while in the dorsal position, with a gallon or more of hot normal salt solution, and before going to bed insert into the vaginal canal against the cervix a cotton-wool tampon saturated with glycerin which should be removed on the following morning.

Twice a week the attending physician should remove from one-half to an ounce or more of blood from the cervix with a sharp bistoury (see endometritis, p. 423); paint the cervix and vaginal vault with tincture of iodin; and introduce into the vagina a cotton-wool tampon of ichthyol and glycerin (25 per cent.), which is removed on the following morning by the patient herself.

The local treatment must be discontinued during the menstrual periods.

General Treatment.—Referring to the general symptoms caused by the disease we find that the patient's health is greatly impaired and that many of the functions of the body are weakened or perverted. It is therefore important that the general treatment should be carefully selected and carried out in order to hasten the cure of the uterine affection, which will be delayed or even prevented unless the physical condition of the patient returns to the normal standard of health.

The diet should be nourishing and easily digested; pure water should be drunk freely; and the bowels opened daily, as any tendency to constipation increases the pelvic congestion and adds to the local trouble. The daily use of a mild laxative and the weekly administration of a saline will usually be sufficient to keep the bowels free. Salines are very beneficial, as they lessen the

pelvic congestion, and good results therefore often follow the use of citrate of magnesia, Hunyadi Janos, and the saline mineral spring waters, especially those containing sodium chlorid.

The patient must exercise daily in the open air and sunshine. Driving, riding, and walking are beneficial, but the bicycle should be avoided. Indoor exercises should be employed to strengthen the pelvic organs and the muscles of the abdomen, as well as to stimulate the circulation of the pelvis (see p. 117). General massage is also indicated and should be given every day, or at least three times a week. A properly made abdominal binder (see p. 850) should be worn when the belly is relaxed and the retentive power of the abdomen impaired. The clothing should be supported from the shoulders and not from the waist, as constriction around the lower abdomen exerts an injurious pressure and increases the congestion of the pelvic organs.

Hydrotherapy.—Good results are obtained by the use of stimulating and tonic baths. The following baths are especially recommended: The cold plunge, the alternating spray, and the sheet bath. In nervous cases sedative baths are indicated, and their use is frequently followed by decided improvement in the neurasthenic symptoms. The following sedative baths give good results. The full hot bath, the Turkish or Russian bath, and the hot sitz-bath.

To Remove the Cause and Associated Pathologic Conditions.—The treatment of these lesions is given under their respective headings as follows: Retrodisplacements of the Uterus (p. 346); Prolapse of the Uterus (p. 329); Lacerations of the Cervix (p. 452), and Laceration of the Perineum (p. 802).

Variations in Treatment.—Amputation of the cervix is recommended as a routine procedure in cases that do not yield to ordinary treatment. The diminution in the size of the uterus after this operation is sometimes very rapid and the results are often most satisfactory. Curetment of the uterine cavity must always be performed and should immediately precede the operation.

SUPERINVOLUTION OF THE UTERUS.

Synonyms.—Puerperal atrophy; Acquired atrophy.

Definition.—A continuation beyond the normal limits of the physiologic process of involution that takes place in the uterus after labor or abortion.

Pathologic Changes.—The body of the uterus and the cervix are smaller than normal and the measurement of the uterine cavity may be reduced to 1 or 1½ inches. In some cases the atrophic changes also involve the uterine appendages.

Causes.—Superinvolution is a very rare disease and its cause is obscure. It probably occurs more often after abortion than after labor at term.

The following are the supposed causes:

Severe post-partum hemorrhage.
Septic infection.
Protracted lactation.
Exhausting diseases occurring during or shortly after the puerperium.

Symptoms.—The chief symptoms are:

Amenorrhea.
Sterility.
Neurasthenia.

The amenorrhea and sterility are caused by the atrophic changes in the uterus and its appendages. Under these circumstances the monthly congestion is absent, the necessary nervous force is wanting, and hence the function of menstruation is suppressed.

The neurasthenic symptoms are accounted for by the general state of the

patient's health and are not due to the local changes in the uterus. These women are often hysteric and nervous; they complain of pain in the lumbo-sacral region and head; they sleep badly and are frequently depressed in spirits; and they suffer more or less from gastro-intestinal disturbances and general debility.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.

The History.—The statement of the patient may show that she was in good health up to her last confinement and that the puerperium was complicated by one of the supposed causative affections.

The Symptoms.—An amenorrhea following a confinement, that is not due to lactation, pregnancy, or some constitutional cause which acts as a drain upon the system, indicates, at least, the possibility of superinvolution being present.

The Physical Signs.—The patient is placed in the dorsal position and examined by (*a*) touch and (*b*) sight.

T o u c h .—The examination is made by *vaginal touch* and *vagino-abdominal palpation.*

The uterus and cervix are found to be smaller than normal, and if a sound is introduced the length of the cavity is shown to be decreased.

S i g h t .—A speculum examination reveals the atrophied cervix, and in some cases it may be so reduced in size that nothing remains to mark its presence except a small knob in the dome of the vaginal vault.

Differential Diagnosis.—The affection must be distinguished from the following forms of atrophy:

Post-operative atrophy.
Senile atrophy.
Congenital atrophy.

Senile atrophy only occurs after the climacteric, and the congenital form is at once excluded if the woman has borne a child. In post-operative atrophy there is always a history of an operation either upon the cervix or for the removal of the tubes and ovaries.

Prognosis.—Superinvolution may sometimes only be temporary and the uterus may return to its normal size under appropriate treatment when the patient's health is restored. If, however, the atrophy is marked and the uterine cavity measures less than two inches, there is but little hope of effecting a cure.

Treatment.—The treatment of the affection is divided into: (1) The operative; (2) the local; and (3) the general.

The Operative Treatment.—Dilatation and curetment of the uterus should be performed as a routine procedure in cases of superinvolution, as the operation increases the blood-supply and stimulates the growth of the uterus.

The Local Treatment.—The object of local treatment is to draw more blood to the pelvic organs and not to diminish the amount. T h e u s e , t h e r e f o r e , o f h o t v a g i n a l d o u c h e s ; a p p l i c a t i o n s o f i o d i n t o t h e c e r v i x a n d t h e v a u l t o f t h e v a g i n a ; o r t h e u s e o f i c h t h y o l a n d g l y c e r i n t a m p o n s a r e a b s o l u t e l y c o n t r a i n d i c a t e d , a s t h e y a l l t e n d t o d r i v e t h e b l o o d f r o m t h e p e l v i s a n d t h u s l e s s e n c o n g e s t i o n .

The following local remedies are indicated:

Warm vaginal douches.
Puncturing the cervix.
Pelvic massage.

Warm Vaginal Douches.—The patient should douche her vagina night and morning, while in the recumbent position, with a gallon of warm normal salt solution (95° to 104° F.).

Puncturing the Cervix.—Twice a week the attending physician should remove from one-half to an ounce of blood from the cervix by puncturing it with a sharp bistoury (see Endometritis, p. 423).

Pelvic Massage.—Pelvic massage should be given three times a week by a nurse who thoroughly understands the manipulative technic of the procedure.

The General Treatment.—The general treatment should be directed toward improving the patient's health, increasing the activity of the pelvic circulation, and curing all coexisting chronic affections.

The diet should be nourishing and easily digested; pure water should be drunk freely; and the bowels opened daily with a mild laxative if any tendency to constipation exists. Aloes, on account of its effect upon the pelvic circulation, is especially indicated in these cases, and it may be advantageously combined with podophyllotoxin. It is important for the patient to have sufficient sleep, and when possible she should take a nap in the afternoon. Sexual intercourse produces congestion of the pelvic organs, and is therefore beneficial except when the patient is physically exhausted.

The patient should exercise daily in the open air and sunshine and indoor exercises should be employed to strengthen the abdominal muscles and stimulate the pelvic circulation (see p. 117). General massage and electricity are also indicated, and should be given three times a week, or more frequently if required.

Drugs.—The following drugs have a special action in determining the blood to the pelvic organs and increasing the congestion of the parts, and one of them should always be employed as a routine method of treatment in cases of superinvolution of the uterus: Binoxid of manganese (gr. j to v, t. i. d.); apiol (♏iij to vj, t. i. d.); and permanganate of potassium (gr. ss to j, t. i. d.).

It is clearly impossible to discuss the general use of drugs in the treatment of this disease, because the indications for internal medication differ in each case, and consequently they must be carefully studied upon general medical principles.

Hydrotherapy.—The hydriatic methods employed in the treatment of the disease depend upon the general condition of the patient and upon the indications in each case. As a rule, however, hot sitz-baths are especially beneficial on account of their relaxing and sedative action upon the pelvic circulation. In cases associated with general debility the sheet bath gives excellent results, especially when it is followed by general massage. The stimulating and tonic action of the cold plunge or the alternating spray bath is often indicated, and in nervous patients who sleep badly great benefit is derived from a Turkish or Russian bath or a full hot bath taken before retiring for the night.

LACERATIONS OF THE CERVIX.

Definition.—A laceration of the cervix may be defined as a rent or tear in the lower segment of the uterus which is usually due to the traumatism of labor.

Causes.—Lacerations of the cervix are very common. The cervical rim is more or less torn in the majority of women during their first confinement, but a large proportion of these tears are insignificant and heal spontaneously without causing any trouble. The chief cause of cervical tears is meddlesome obstetrics; for example, want of care or judgment in the use of forceps, premature rupture of the bag of waters, the injudicious use of ergot, mechanic dilatation of the cervix, and roughness in performing podalic version.

These causes are avoidable, as a rule, and should therefore be borne in mind in order to reduce to a minimum the frequency of cervical lacerations.

In some cases lacerations take place as the result of an unyielding condition of the cervix. The presenting part pressing upon the os, under these circumstances, fails to dilate it, and as a result the tissues are torn. A rigid condition of the cervix is caused by malignant infiltrations and hyperplasia, and is also likely to be present in women who are delivered of their first child late in life. Again, premature labor or abortion may result in a torn cervix, owing to the fact that the tissues are not prepared to undergo dilatation; and, finally, a tear may be caused by the spontaneous expulsion of a fibroid polypus or an instrumental dilatation of a non-gravid uterus.

A precipitate labor is often the cause of an extensive traumatism, and the same condition is likely to result when a disproportion in size exists between the child and the birth-canal. Sometimes the prolonged pressure of the child's head upon the cervix during a tedious labor may be followed by necrosis and subsequent loss of tissue.

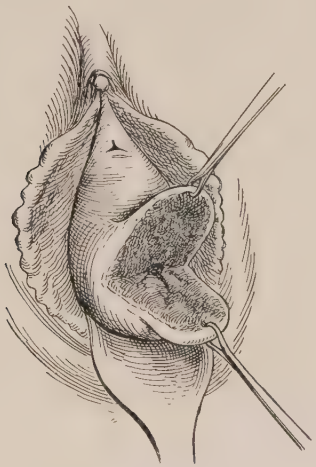


Fig. 432.

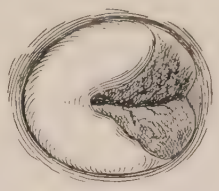


Fig. 433.

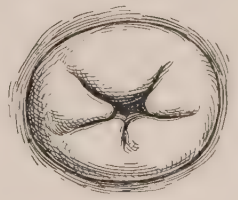


Fig. 434.

Varieties of Cervical Tears.

Fig. 432, Bilateral; Fig. 433, unilateral; Fig. 434, multiple or stellate.

Varieties.—Lacerations of the cervix may occur at any part of its circumference. They may be *bilateral*, or on both sides; *unilateral*, or on one side; and *multiple* or stellate.

Bilateral tears are most frequently observed, and the traumatism is generally more extensive on the left side than on the right, owing, no doubt, to the greater predominance of left occipito-anterior positions. For the same reason when a laceration is unilateral it usually occurs on the left side. Transverse tears, dividing the cervix into an anterior and a posterior lip, are more common than antero-posterior lacerations. The probable reason for this fact is that the latter heal, as a rule, at once on account of the pressure exerted by the lateral walls of the vagina, which keeps the torn surfaces in apposition. When a laceration is very extensive, it may extend into adjacent parts and involve the structures posterior to the uterus, the bladder, or the base of the broad ligaments.

A laceration of the cervix may be *complete* or *incomplete;* the former splits

all the tissues of the cervical rim at the point of injury, while the latter does not extend through the mucous membrane which covers its vaginal portion.

Symptoms.—The symptoms are not pathognomonic and are due to the lesions which are caused by the laceration. The most constant of these secondary conditions are subinvolution of the uterus, endometritis, and uterine displacements, and the symptoms which are usually described as being due to lacerations of the cervix are in reality caused by one or all of these complications.

The following are the most frequent of these symptoms:

Lumbosacral pain or backache.
A feeling of weight or bearing-down in the pelvis.
Vertical headache.
Leukorrhea.
Menorrhagia; Metrorrhagia.
Sterility; Abortion.

In the course of time the general and nervous systems are affected and the patient loses weight, her appetite becomes fickle, she is insufficiently nourished, digestion is impaired, chronic constipation eventually causes auto-intoxication, there are neuralgic pains in various parts of the body, and finally neurasthenia develops with its various sensory and motor phenomena.

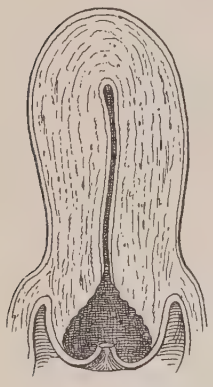


Fig. 435.—Incomplete Laceration of the Cervix.

In addition to the above symptoms, there are certain local and general manifestations which develop and are directly due to pathologic changes in the cervix itself. The cicatricial tissue resulting from an attempt upon the part of nature to repair the laceration often produces reflex irritations which are not only annoying but exhausting to the patient, and it is a matter of everyday experience how quickly these symptoms cease when the scar tissue is removed. The plug of cicatricial tissue is not the only cause for the reflex irritations, and we find that other pathologic changes in the cervix—sclerosis and cystic degeneration—are often responsible for many of the symptoms.

In extensive tears involving the base of the broad ligaments pain is felt during defecation and sexual intercourse, and also when the patient walks or takes any active form of exercise. A digital examination in these cases causes suffering, especially if the pelvic structures are put upon the stretch by pushing the cervix upward with the tip of the finger. If the cervix is deeply eroded or has undergone cystic degeneration, it is not uncommon to observe a show of blood after sexual intercourse.

A laceration of the cervix presents no symptoms at the time of its occurrence unless the circular artery is torn and a free arterial hemorrhage occurs.

Pathologic Changes in the Cervix.—About one-half of all lacerations heal spontaneously and cause no local or general symptoms. When, however, this does not occur, the cervix undergoes certain pathologic changes which are always more or less modified by the extent and situation of the tear, and are especially marked in bilateral lacerations which extend up to the vaginal junction. As the result of a laceration normal involution ceases and the cervix becomes congested and inflamed. The cervical tissues eventually become hypertrophied and the cervix feels hard and indurated. Gradually the torn

surfaces become separated and the cervix presents a club-shaped appearance. The rolling out of the lips of the cervix exposes the cervical canal and the mucous membrane soon becomes inflamed and swollen. The glands take on increased activity (*cervical catarrh*), and, finally, as the result of long-continued irritation and exposure, erosions and cystic degeneration make their appearance. Nature in her effort to repair the injury fills the angle of laceration with a plug of scar tissue which gives a rounded appearance to the bottom of the wound and causes the reflex symptoms referred to above.

Results.—The results of a laceration are either *immediate* or *remote*. Of the former, the most frequently observed are, hemorrhage, sepsis, and vesico-vaginal fistula. The septic infection may extend from the wound to the uterine cavity and the oviducts, or it may begin in the cellular tissues of the pelvis when they are exposed or opened by an extensive laceration. The principal remote results are subinvolution of the uterus; chronic endometritis; uterine displacements, due to subinvolution or to contraction of cicatricial tissue in the cellular structures behind the uterus; chronic tubal and ovarian disease; and cancer.

Diagnosis.—The diagnosis is made by (*a*) touch and (*b*) sight.

Touch.—The cervix is found to be enlarged, hardened, and indurated; it is no longer rounded at its extremity like a cone, but is broad and club-shaped; and the everted or rolled-out edges of its torn lips are easily recognized as the

FIG. 436.

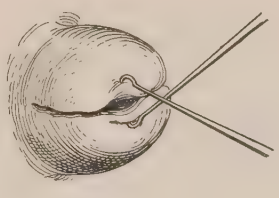


FIG. 437.

DIAGNOSIS OF CERVICAL TEARS.

Fig. 436 shows a bilateral laceration; Fig. 437 shows the divided lips of the same tear brought into apposition by crossed tenaculums.

examining finger passes upward into the vaginal vault. The angle of laceration is readily felt and the plug of scar tissue at the bottom of the wound is easily palpated and pressure on it causes local and radiating pains. The everted mucous membrane of the cervical canal and the erosions have a swollen and velvety feel and the enlarged racemose glands (*cystic degeneration*) give the sensation of small shot under the tip of the finger.

Sight.—The patient is placed in the knee-chest or Sims's position and Simon's speculum introduced into the vagina. As the cervix comes into view the laceration and pathologic changes are readily observed. A final test as to the nature of the lesion is made by hooking a tenaculum into each lip of the cervix and drawing them together after crossing the instruments. If a laceration is present, the cervix is thus temporarily restored to its normal shape and the eversion of the mucous membrane of the cervical canal and the erosions will disappear as the divided lips are brought into apposition. This manipulation is always successful except when the laceration is associated with a large amount of infiltration which thickens and hardens the tissues and renders the lips of the torn cervix immovable.

The diagnosis of an *incomplete* tear is made by passing a sound into the cervical canal and noting its increased caliber, and at the same time feeling the tip of the instrument through the uninjured mucous membrane (Figs. 438 and 439).

A tubular or bivalve speculum should never be employed in making the diagnosis of a lacerated cervix, as the lumen of the former instrument is not large enough to expose the entire surface of the torn neck, while the latter increases the rolling-out of the lips and the eversion of the mucous membrane of the cervical canal and consequently gives a wrong idea of the pathologic changes.

Differential Diagnosis.—The affection must be distinguished from: (*a*) Carcinoma; (*b*) eversion of the mucous membrane of the cervical canal without laceration; and (*c*) erosion of the cervix without laceration.

Carcinoma.—Carcinoma may be mistaken for a laceration of the cervix which is associated with extensive erosions and cystic degeneration. In cancer true ulceration is present; the tissues are brittle and bleed freely; the leukorrheal discharge has the characteristic malignant odor and appearance; and the disease is rapid in its course. In case of doubt an examination of a piece of the tissues must be made with the microscope.

Eversion of the Mucous Membrane of the Cervical Canal.—Eversion of the intracervical mucous membrane is rare except when the cervix is lacerated, but the fact that it may exist alone must always be remembered. I have observed a number of these cases in young women who were engaged to be married

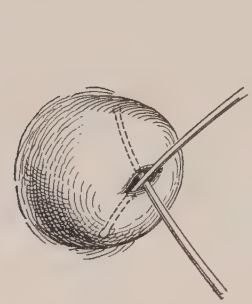


Fig. 438.

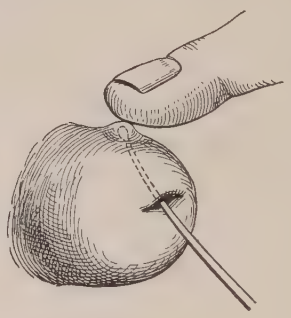


Fig. 439.

Diagnosis of an Incomplete Laceration of the Cervix with a Uterine Sound (page 451).
Fig. 438 shows the increased caliber of the cervical canal; Fig. 439 shows the tip of the sound being felt through the uninjured mucous membrane.

and in whom the pelvic organs were congested from the "sexual engorgement in love-making."

Erosion of the Cervix without a Laceration.—This condition is not uncommon in women who are broken down in health and suffer with an irritating discharge from the vagina or the endometrium. The diagnosis is based upon the physical signs and the absence of all local symptoms of laceration.

Prognosis.—The prognosis of lacerations of the cervix depends upon the results of the traumatism, which, as stated above, are either immediate or remote, and upon the extent and situation of the tear. The laceration itself is easily cured by operative measures, but some of its consequences are serious and a guarded prognosis must be given. For example, little if anything can be done for a uterine displacement caused by cicatricial contraction of the cellular tissues behind the uterus, and chronic tubal disease caused originally by a lacerated cervix necessitates an abdominal section to effect a cure.

Treatment.—In considering the treatment of lacerations of the cervix it must be borne in mind that 50 per cent. of these tears are physiologic and should be let alone, as they are followed by no evil results. On the other hand, however,

it must also be remembered that cervical lacerations are often responsible for certain local and general conditions which not only destroy the health of the patient but are even dangerous to life. The likelihood of cancer developing at the site of a laceration must not be forgotten, and I believe we will always be on the safe side in operating upon selected cases solely with the object in view of preventing the possibility of malignant disease occurring.

The treatment is always operative in character, as it is impossible for the edges of the wound to be reunited and the intracervical mucous membrane restored to its normal position by any other means.

Indications for Operation.—As a large number of lacerations require no treatment whatever, it is important to have a clear and definite idea as to what class of cases require operative interference.

The following rules have been formulated for this purpose:

1. Operate upon all lacerations which are complicated with induration and hypertrophy of the cervical tissues; eversion of the intracervical mucous membrane; cystic degeneration; and erosion.

2. Operate upon all lacerations which are responsible for subinvolution of the uterus, endometritis, and uterine displacements.

3. Operate upon all lacerations which are associated with a sensitive plug of scar tissue in the angle of the wound.

Contraindications for Operation.—Grave pelvic disease is a contraindication for operative interference in cases of laceration of the cervix. This does not include all forms of pelvic lesions, such as simple congestion or inflammation of the uterine appendages, but only those conditions in which pus exists or firm adhesions are present. There is always considerable dragging upon the uterus during an operation upon the cervix, and these manipulations may cause a fatal peritonitis by breaking up old adhesions.

Preparatory Treatment.—The object of the preparatory treatment is to remove so far as possible the pathologic changes in the cervix and to place the patient in a good general condition for operation. If the patient is operated on within three or four months after confinement before the remote results and pathologic changes referred to have occurred, there is no need, as a rule, for any preparatory treatment. But if the case is neglected for many months or years, as often happens, the cervix becomes indurated, hypertrophied, and eroded, and the intracervical mucous membrane everted and the seat of extensive cystic degeneration. Under these circumstances an immediate operation would fail not only in restoring the parts to their normal condition, but also in curing the reflex and other symptoms. The importance, therefore, of making a careful examination before discharging a patient after confinement should always be borne in mind, as a laceration of the cervix may be discovered and an early operation performed to prevent subsequent complications occurring.

Another reason, which is often overlooked, for the necessity of a preparatory course of treatment is its modifying effect upon the cervical lesions and the subsequent selection of a less radical operation. For example, a laceration complicated with a hard, indurated, hypertrophied cervix usually demands an amputation for its cure, whereas if the operation is delayed for a few weeks the preparatory course of treatment may soften the cervical tissues and the less radical procedure of trachelorrhaphy may be substituted.

The same is true of all the local changes resulting from lacerations of the

cervix and, as will be referred to later on, their presence or absence determines the question of operative technic.

The length of time required for the preparatory treatment depends upon the character of the cervical lesions. If the cervix is slightly affected, two or three weeks are sufficient; in other cases a much longer period will be found necessary to modify the lesions and place the parts in the best possible condition for operation. As a general rule, nothing further can be accomplished after three months of systematic treatment, and at the end of that time the operation of selection should be determined upon.

The preparatory treatment is *local* and *general* in character and may be discussed as follows:

Local Treatment.—Under this heading are considered (1) the routine treatment and (2) the treatment of special conditions.

Routine Treatment.—The routine treatment consists in the use of hot vaginal injections and the local application of ichthyol and glycerin.

The patient should douche her vagina every night and morning with a gallon of hot normal salt solution, and before going to bed introduce a cotton-wool tampon saturated with ichthyol and glycerin (25 per cent.) against the cervix, and remove it on the following morning. This treatment is continuously carried out independently of the local applications which are made by the attending physician from time to time for the cure of special conditions.

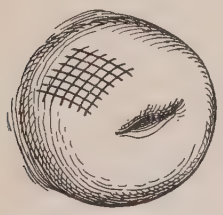


FIG. 440.—SCARIFICATION OF THE CERVIX.
Showing the method of making the superficial incisions.

Treatment of Special Conditions.—The special conditions which require treatment are subinvolution of the cervix, erosion, and cystic degeneration. In addition to the routine methods just described, local depletion is of great benefit when the cervical tissues are subinvoluted and indurated. From a half to one ounce or more of blood is removed from the cervix twice a week by puncturing it with a sharp bistoury. (See endometritis, p. 423.) The entire cervix and the vaginal vault are then painted with tincture of iodin and a tampon of ichthyol and glycerin (25 per cent.) is placed in the vagina. If the cervix is eroded, it is scarified once or twice a week and an ointment of iodoform (U. S. P.) applied. The ointment is spread over the tampon of ichthyol and glycerin and placed against the cervix. The scarification should extend slightly beyond the eroded surface and should consist of a number of superficial parallel incisions which are crossed by others at right angles. In cases of cystic degeneration each cyst is punctured with a sharp bistoury, its contents evacuated, and the iodoform ointment applied to the cervix. If there is a large number of cysts only six or eight should be punctured at one sitting, otherwise the parts may become irritated and cause a severe inflammatory reaction. In case the cysts refill after they have been punctured, their walls should be destroyed by applying pure carbolic acid directly to each sac.

The local treatment must be discontinued during the menstrual periods.

General Treatment.—The treatment should be directed toward placing the health of the patient in the best possible condition. The daily use of a saline is important on account of its depleting effect upon the pelvic circulation, and the patient should therefore have one watery bowel movement every twenty-four hours. The digestion should be looked after and any gastro-intestinal trouble corrected. The food should be easily digested and nourishing, and if tonics are indicated such remedies as strychnin, quinin, and iron may be administered.

The patient should be out several hours every day in the open air and sunshine; and every night and morning she should devote a few minutes to indoor exercise in order to strengthen the abdominal walls and pelvic contents (see p. 117). The skin should be kept in a healthy condition by careful attention to general and local cleanliness, and in some cases a systematic course of stimulating baths is indicated.

Treatment of Complications.—It is important to bear in mind that subinvolution of the uterus, endometritis, and uterine displacements are usually associated with chronic lacerations of the cervix, and are, as a rule, the direct results of the traumatisms. Therefore if a retrodisplacement of the uterus exists, the laceration of the cervix is first repaired and then the abdomen is immediately opened and the fundus attached to the anterior abdominal wall (*ventral suspension of the uterus*, see p. 353). Again, if endometritis is present dilatation and curetment of the uterine cavity must precede the operations for the repair of the torn cervix and the replacement of the uterus. And, finally, if subinvolution of the uterus is associated with the endometritis and uterine displacement, the special operations for their relief will at the same time tend to cure the hypertrophy. The mere restoration of a cervical tear will not cure the complications, and if this fact is not borne in mind failure will often result after operative measures have been carried out.

Selection of the Operation.—A torn cervix may be restored either by a *trachelorrhaphy* or an *amputation*, and it is important to know which of these operations to select in a given case, otherwise the results will be unsatisfactory or bad.

Trachelorrhaphy should be performed in cases in which there is only slight loss of tissue, and an absence of induration, cystic degeneration, or extensive erosion.

Amputation, on the other hand, is indicated in stellate lacerations; in tears which are associated with great loss of tissue; and in cases complicated with cervical induration, cystic degeneration, and extensive erosion.

The selection of the operation in many instances depends upon good judgment and common sense, and the necessity for a course of preparatory treatment, as mentioned above, must not be forgotten. It is obviously bad surgery to restore a cervical canal which is the seat of cystic degeneration by performing a trachelorrhaphy, because it does not cure the diseased intracervical mucous membrane, which although hidden from view by the operation still remains a focus of local irritation, keeping up many of the reflex symptoms and chronic changes in the uterus. Again, a cervix which has become indurated and sclerotic and remains so after a careful preliminary course of treatment is clearly unsuited for a reparative operation, and even if the denuded edges of the laceration unite, the local irritation due to the sclerosis will continue.

Trachelorrhaphy.—Technic of the Operation.—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 830 and 831.

Position of the Patient.—Dorsal posture.

Number of Assistants.—An anesthetizer, two assistants, and a general nurse.

Instruments.—(1) Simon's speculum (curved blade); (2) two bullet forceps; (3) scalpel; (4) straight scissors; (5) tissue forceps; (6) dressing forceps; (7) needle-holder; (8) shot compressor; (9) two small full-curved Hagédorn needles; (10) perforated shot; (11) silkworm-gut—15 strands (Fig. 441).

The list of instruments required in the operation of *dilatation and curetment* of the uterus, which should always precede a trachelorrhaphy, will be found on page 955.

Operation.—First Step.—The speculum is introduced into the vagina and the anterior and posterior lips of the cervix seized in the median line with bullet forceps.

Second Step.—The area of denudation is marked out with the scalpel on

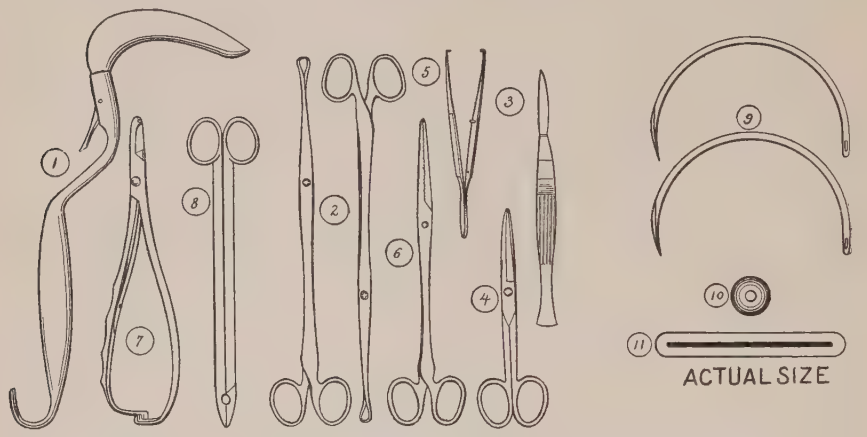


Fig. 441.—Instruments, Needles, Suture Material, and Perforated Shot Used in the Operation of Trachelorrhaphy (page 455).

the torn margins of the cervix in such a manner that the incisions pass beyond the angles of laceration externally and leave a strip of mucous membrane $\frac{1}{4}$ of an inch wide in the middle of each everted lip for the reconstruction of the cervical canal. The object of the preliminary incisions is to prevent the removal of an unnecessary amount of tissue and to obtain clean-cut approximation surfaces.

Fig. 442.—First Step.

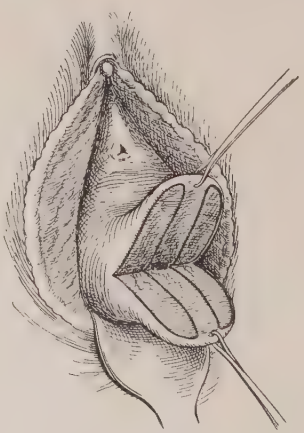


Fig. 443.—Second Step.

Trachelorrhaphy.

Third Step.—The edge of the area to be denuded is seized with forceps at the free end of the cervix and the superficial tissues removed with a scalpel down to the angle of laceration. The opposite lip is then denuded in the same manner and direction and a wedge-shaped piece excised from the angle of lacera-

tion. The opposite side of the cervix is then denuded, if the tear is bilateral, and the raw edges brought together with crossed bullet forceps to test the degree of tension when the parts are finally approximated. If the edges of the torn lips

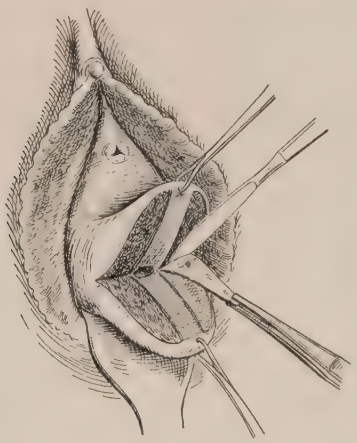


FIG. 444.—Third Step.

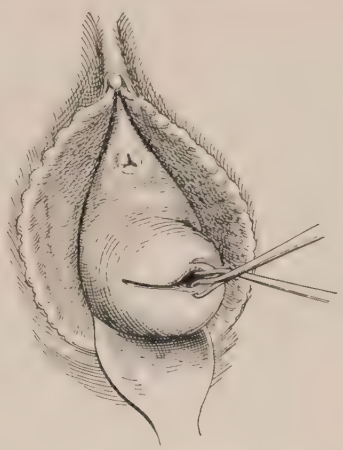


FIG. 445.—Third Step.

TRACHELORRHAPHY.

do not come together without undue strain, the redundant tissue should be removed with scissors and the test again made with the bullet forceps.

FOURTH STEP.—The sutures are introduced as follows: The first suture enters the cervix near the outer edge of the denudation at the angle of laceration, passes completely under the denuded surface, and emerges in the cervical canal

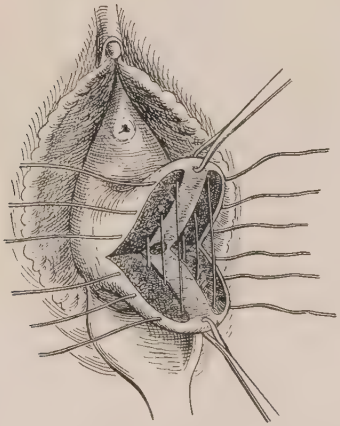


FIG. 446.—Fourth Step.

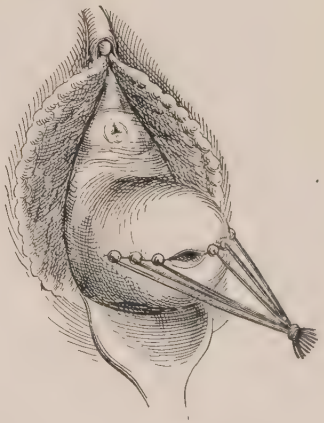


FIG. 447.—Fourth Step.

TRACHELORRHAPHY.

at the margin of the strip of mucous membrane. It is then passed through the edge of the intracervical mucous membrane of the opposite lip of the cervix and brought out just behind the external line of denudation. The remaining sutures are introduced in the same manner and secured with perforated shot.

Fifth Step.—The straight dressing forceps is passed into the uterine cavity to test the integrity of the new cervical canal and the vagina irrigated with corrosive sublimate solution (1 to 2000) followed by normal salt solution. The parts are then dried, a loose gauze tampon placed against the cervix, and the vulva protected with a compress secured by a T-bandage.

Fig. 448.—Trachelorrhaphy—Fifth Step. Testing the integrity of the cervical canal.

Special Directions.—If the uterus is more or less immovable, care must be taken not to make too much traction upon it when the cervix is pulled down with bullet forceps at the beginning of the operation, otherwise old adhesions may be torn and the patient's life placed in jeopardy. It is important to remove all of the scar plug at the angle of the wound, and also any induration which may remain in the lips after the parts have been denuded. The sclerotic tissues are easily recognized by touch and removed by lifting them up with tissue forceps and cutting them away with scissors. The bleeding is usually very slight and is controlled when the sutures are tied. If the circular artery is cut, the suture at the angle of laceration should be introduced at once and tied. In cases of bilateral laceration the sutures on both sides of the cervix should be introduced before any of them are tied, as it is difficult otherwise to pass them properly and secure an accurate approximation. Without exception, the sutures must pass completely under the denuded surfaces, and unless this rule is observed only a partial union takes place and a condition resembling an incomplete tear results.

Variations in the Technic.—An incomplete laceration of the cervix is first made complete by cutting through the vaginal mucous membrane and then denuding the edges of the torn lips as in an ordinary laceration. The subsequent steps of the operation are the same as in bilateral and unilateral tears.

If a colpoperineorrhaphy is performed at the same time as a trachelorrhaphy, chromicized catgut should be substituted for silkworm-gut in the cervix, otherwise the freshly united perineum may be torn when the unabsorbable cervical sutures are removed.

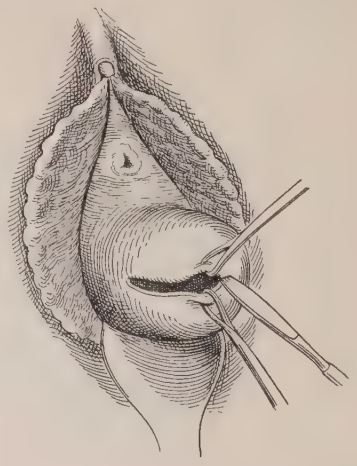


Fig. 440.—Operation for Incomplete Laceration of the Cervix.

Shows the laceration being made complete by cutting through the vaginal mucous membrane of the cervix.

An amputation of the cervix is indicated in stellate or multiple tears, and the practice of cutting out lobes between fissures and uniting the raw edges should be condemned except in very rare cases in which only a small single lobe exists. Another practice which is not

founded upon good surgical principles is excision of the mucous membrane of the cervical canal, when it has undergone cystic degeneration, and the repair of the cervical laceration by the operation of trachelorrhaphy. Under these conditions amputation is the operation of selection and not trachelorrhaphy, which should never be performed if the mucous membrane is extensively diseased.

After-treatment.—*Care of the Wound.*—The vulvar compress is temporarily removed when the bowels and bladder are evacuated. The gauze packing is taken out in twenty-four hours and not reintroduced, and the vagina is then irrigated daily with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution. The vaginal irrigations are kept up until the patient gets out of bed, and then a daily douche of a gallon of hot normal salt solution is given for several weeks. The sutures are removed on the eighth day.

The *care of the bladder and bowels*, the *regulation of the diet*, and the *relief of restlessness and pain* are discussed under the After-treatment of Dilatation and Curetment of the Uterus on page 960.

Getting Out of Bed.—The patient should remain in bed for ten days and be allowed to go out at the end of the second week.

Amputation of the Cervix.—Technic of the Operation.—The *Preparation of the Patient;* the *Preparations for the Operation;* the *Position of the Patient;* and the *Number of Assistants* are the same as in the operation of trachelorrhaphy described on page 455.

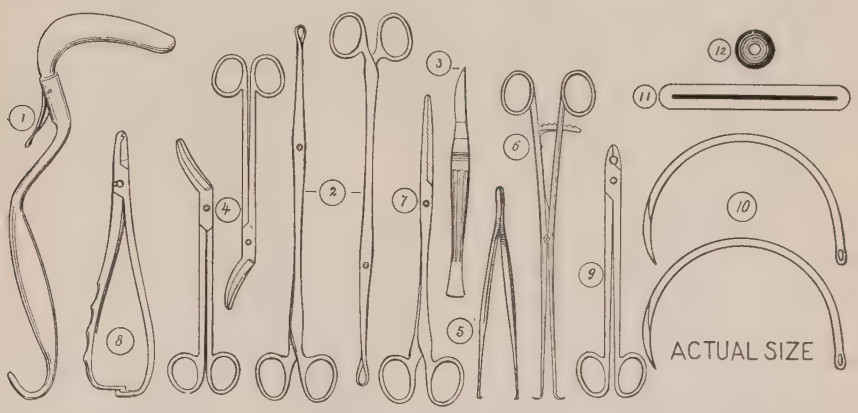


Fig. 450.—Instruments, Needles, Suture Material, and Perforated Shot Used in the Operation of Amputation of the Cervix.

Instruments.—(1) Simon's speculum (curved blade); (2) two bullet forceps; (3) scalpel; (4) right and left slightly curved scissors; (5) tissue forceps; (6) reverse-acting bullet forceps; (7) dressing forceps; (8) needle-holder; (9) shot-compressor; (10) two small full-curved Hagedorn needles; (11) silkworm-gut—20 strands; (12) perforated shot.

The list of instruments required in the operation of *Dilatation and Curetment* of the uterus which should always precede an amputation of the cervix will be found on page 955.

Operation.—First Step.—The speculum is introduced into the vagina and the anterior and posterior lips of the cervix seized with bullet forceps and drawn down toward the vulvar orifice. The dressing forceps is then introduced into

the bladder to determine the relation existing between it and the cervix in order to prevent wounding the organ when the anterior cervical lip is amputated.

Second Step.—A circular incision is made with the scalpel through the mucous membrane completely around the cervix beyond the diseased and lacerated area and the anterior and posterior lips amputated with the curved scissors and knife.

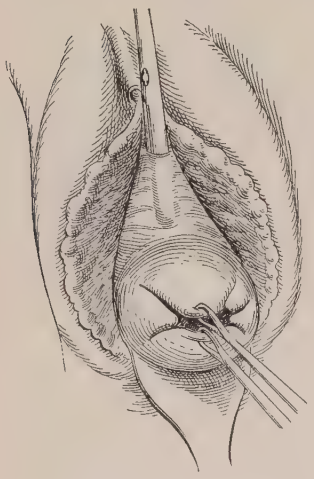


Fig. 451.—Amputation of the Cervix —First Step.
Showing the dressing forceps introduced into the bladder.

Third Step.—The reverse-acting bullet forceps is introduced into the cervical canal and its blades separated in order to control the stump of the cervix and pull it down while the sutures are introduced. The instrument also marks the position of the canal and is a guide when the sutures are passed.

Fourth Step.—The vaginal mucous membrane is drawn over the cervical stump and secured with shotted silkworm-gut sutures. The first suture, which is introduced at the left lateral edge of the stump, enters the vaginal mucous membrane anteriorly about one-eighth of an inch from its divided edge, passes through the cervical tissue, and emerges at the center of the raw surface. It is then reintroduced into the cervical tissue and brought out posteriorly through the vaginal mucous membrane opposite the point of entrance. The remaining sutures on the left side of the cervical canal, usually two in number, are introduced in a similar manner, and the stump on the right side is then sutured in the same way.

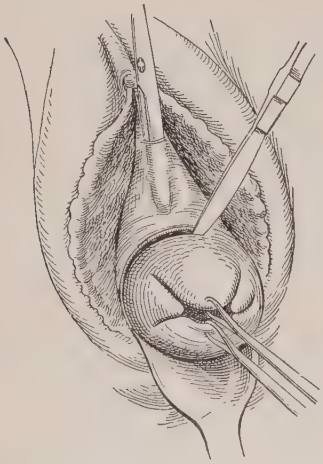


Fig. 452.—Second Step.

Fig. 453.—Second Step.

Amputation of the Cervix.

A space of at least one-third of an inch must be left between the two middle sutures to prevent atresia and form an opening for the cervical canal.

When all the sutures are in position, the wound is closed by securing them with perforated shot and an instrument is then passed into the uterine cavity to test the integrity of the cervical canal.

Fifth Step.—The vagina is irrigated with a solution of corrosive sublimate (1 to 2000), followed by normal salt solution, and the opening into the cervical canal packed with a narrow strip of gauze. The vagina is finally dried and the vulva protected with a compress secured by a T-bandage.

Variations in the Technic.—When a colpoperineorrhaphy is performed at the same time as an amputation, chromicized catgut should be substituted for silkworm-gut in closing the cervical stump.

After-treatment.—The strip of gauze should remain in the cervical canal for two days to prevent adhesions occurring between the raw edges of the wound.

The rest of the after-treatment is the same as that following the operation of trachelorrhaphy (see p. 459).

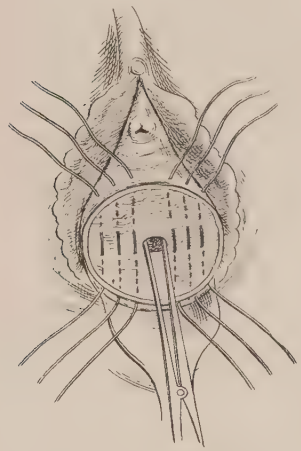


Fig. 454.—Fourth Step.

Fig. 455.—Fourth Step.

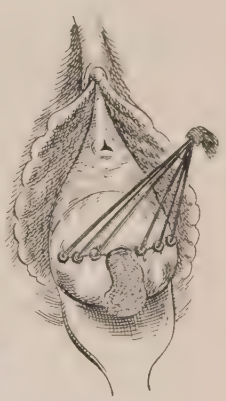


Fig. 456.—Fifth Step.

Amputation of the Cervix.

Immediate Operations.—Lacerations of the cervix should not be repaired at the time of their occurrence, as it is usually impossible, on account of the condition of the cervical tissues after labor, to recognize the extent or character of the traumatism and approximate the torn structures. And, furthermore, the danger of septic infection resulting from an immediate operation is so apparent that this plan of treatment is unsurgical and should be earnestly condemned.

If the circular artery is torn, however, it should be controlled by a deep suture of chromicized catgut and the laceration repaired at the same time.

Intermediate Operations.—The so-called intermediate operation for lacerations of the cervix consists in repairing the injury after the fifth day of the puerperium by removing the granulations and suturing the edges of the cervical tear. Notwithstanding that this procedure is advocated by some of the most prominent teachers of obstetrics, it is not based upon sound surgical principles, and should be condemned because of the danger of causing infection at a time when an aseptic parturient tract is of the utmost importance to the safety of the patient.

HYPERTROPHY OF THE CERVIX.

Hypertrophy of the neck of the uterus will be divided into three varieties, as follows:

Supravaginal hypertrophy.
Infravaginal hypertrophy.
Apparent hypertrophy.

SUPRAVAGINAL HYPERTROPHY.

Definition.—A true hypertrophy of the cervical tissues above the junction of the cervix with the vagina.

Causes.—The hypertrophy is probably due to an abnormal development of the supravaginal cervix at the time of puberty. It is very rarely met in women who have borne children, being almost exclusively limited to virgins and those who are sterile.

Pathologic Changes.—The increased weight of the uterus stretches the ligaments and the organ descends, pulling with it the upper part of the vagina. The prolapse gradually becomes more and more marked, until finally the cervix appears at the vulvovaginal orifice or beyond it, and the vagina is turned inside out as in the ordinary form of uterine descent. The exposed mucous membrane of the vagina undergoes the same changes that have already been described under prolapse of the uterus.

FIG. 457.—SUPRAVAGINAL HYPERTROPHY OF THE CERVIX. Note the length of the cervix between the vaginal vault and the anterior and posterior reflections of the peritoneum.

Symptoms.—As descent of the uterus is the essential pathologic change in supravaginal hypertrophy of the cervix, the symptoms are, therefore, the same as those of uterine prolapse (see p. 325).

Diagnosis.—This is the only form of uterine prolapse met in virgins and sterile women, except the very rare cases of acute descent that are caused by violence.

The patient is placed in the dorsal position and examined by (*a*) sight and (*b*) touch.

Sight.—If the prolapse is complete, the cervix will be seen protruding from the vulvovaginal orifice, which is always more or less dilated; the vagina is turned inside out; and there is no evidence of a laceration in the pelvic floor or in the cervix, which would be the case in true descent of the uterus. Again, when the patient bears down or strains, the protrusion of the uterus is not greatly increased, as in prolapse, and it does not tend to recede within the vagina when the woman assumes the recumbent posture.

When the cervix is still within the vagina, the perineum is intact; the vulvovaginal orifice is not dilated; and there is no evidence of rectocele or cystocele or relaxation of the lower third of the vaginal wall. In true prolapse, however, the vulva is gaping, the perineum torn, and the lower third of the vagina is relaxed. This is due to the fact that in supravaginal hypertrophy of the cervix

the upper part of the vagina sags first, while in prolapse the bulging of the anterior and posterior lower third of the canal takes place before the descent of the uterus.

Touch.—Introducing the index-finger of the left hand into the vagina, the infravaginal cervix is found to be normal in size and shape, but occupying a lower position in the pelvis. Vagino-abdominal palpation reveals the position of the fundus of the uterus, which is higher than is consistent with the degree of cervical descent, indicating, therefore, not only prolapse, but elongation of some part of the organ, which can often be demonstrated, by palpation, to be situated in the supravaginal cervix.

When descent of the uterus is marked in hypertrophy of the cervix, there is a

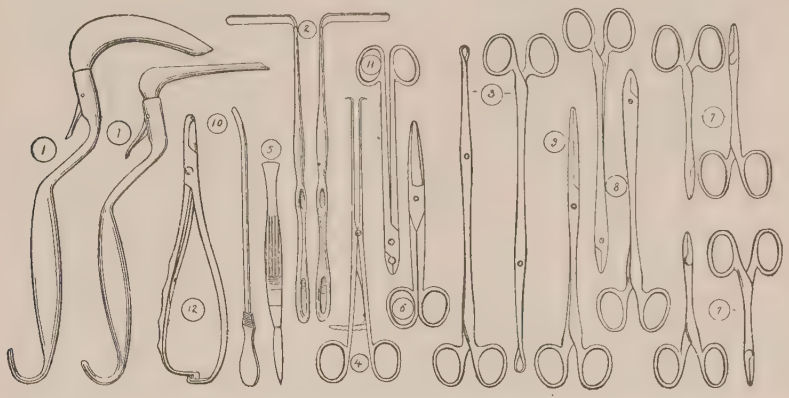


FIG. 458.—INSTRUMENTS USED IN THE OPERATION OF HIGH AMPUTATION OF THE CERVIX (page 464).

decided want of mobility in the organ and it is more or less difficult to replace. This is due to the enlarged uterus encroaching upon the capacity of the pelvic cavity, and is not met in cases of true prolapse, where the reduction of the organ is easily accomplished.

Prognosis.—A cure can only be effected by surgical measures and no form of palliative treatment is of any benefit.

Treatment.—The following operations are employed:

High amputation of the cervix.
Anterior and posterior colporrhaphy.
Hysterorrhaphy.

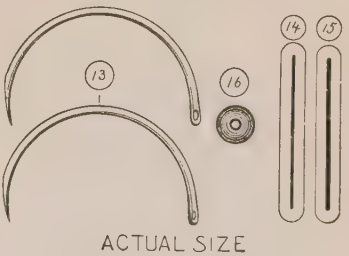


FIG. 459.—NEEDLES, SUTURE MATERIALS, AND PERFORATED SHOT USED IN THE OPERATION OF HIGH AMPUTATION OF THE CERVIX (page 464).

High Amputation of the Cervix.—High amputation of the cervix is the only operation required when hypertrophy of the cervix is associated with a slight degree of descent, but if the uterine prolapse is marked and the vaginal walls are relaxed, it must be followed later on by colporrhaphy or hysterorrhaphy or both. These operations should not be performed too soon after the amputation, except in extreme cases, as the subsequent decrease in the size and weight of the uterus, as well as the increase in the tonicity of the vaginal walls, may render further surgical interference unnecessary.

Technic of the Operation.—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 830 and 831.

Position of the Patient.—Dorsal position.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Instruments.—(1) Simon's speculums (curved and flat blades); (2) two lateral vaginal retractors; (3) two bullet forceps; (4) reverse-acting bullet forceps; (5) scalpel; (6) straight scissors; (7) four short hemostatic forceps; (8) two long hemostatic forceps; (9) dressing forceps; (10) bladder sound; (11) shot compressor; (12) needle-holder; (13) two small full-curved Hagedorn needles; (14) plain cumol catgut No. 3, six envelopes; (15) silkworm-gut—15 strands; (16) perforated shot (Figs. 458 and 459).

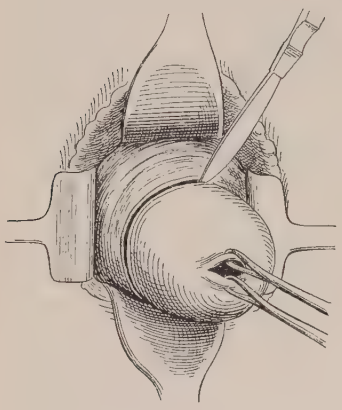


Fig. 460.—High Amputation of the Cervix—First Step.

Operation.—First Step.—Simon's speculums and lateral vaginal retractors are introduced into the vagina and the anterior and posterior lips of the cervix seized with bullet forceps and pulled down toward the vulvovaginal orifice. A circular incision is then made just above the vaginocervical junction through the wall of the vagina down to the tissues of the cervix.

If there is much hemorrhage from the divided vaginal arteries, they should be seized with hemostatic forceps and ligated with catgut.

Second Step.—Strong traction is made upon the cervix with the bullet for-

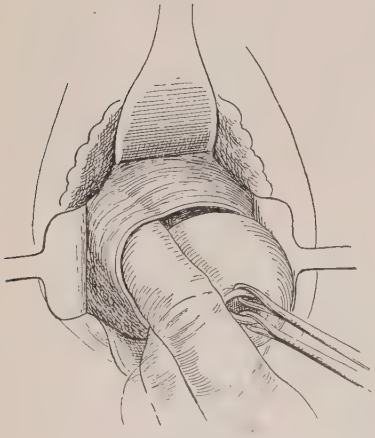


Fig. 461.—Second Step.

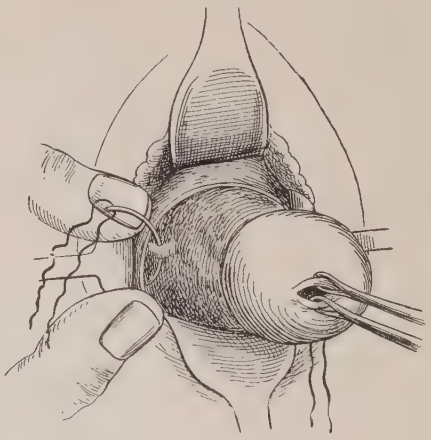


Fig. 462.—Second Step.

High Amputation of the Cervix.

ceps and the cervical tissues separated with the fingers in front and behind from the surrounding structures as far as the level of the uterine blood-vessels. The arteries are then ligated on each side close to the cervix with catgut ligatures.

Third Step.—The cervix is divided on each side as far as the uterine blood-vessels and a silkworm-gut suture carried on a curved Hagedorn needle passed

through the center of the anterior vaginal wall, the loose connective tissue, and the cervix into the cervical canal. A suture is then passed in a similar manner through the center of the posterior vaginal wall and cervix into the cervical canal.

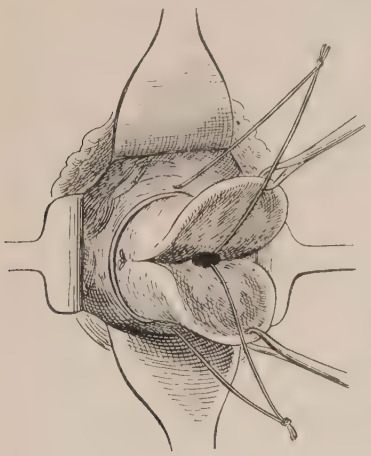


FIG. 463.—**Third Step.**

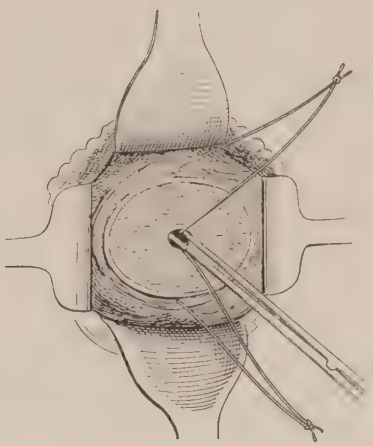


FIG. 464.—**Fourth Step.**

HIGH AMPUTATION OF THE CERVIX.

FOURTH STEP.—The anterior and posterior lips of the cervix are amputated immediately below the uterine vessels and the reverse bullet forceps introduced just within the uterine cavity to control the uterus while the remaining sutures are being introduced.

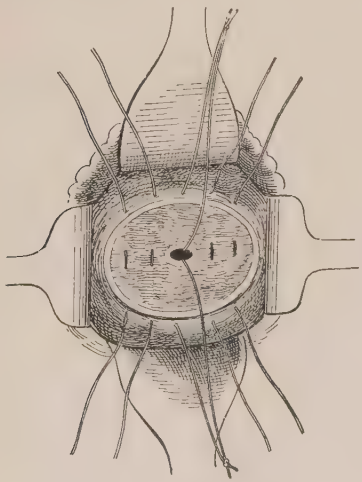


FIG. 465.—**Fifth Step.**

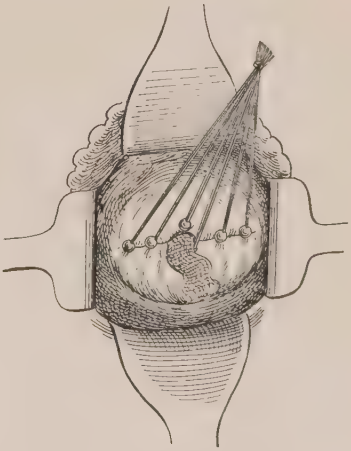


FIG. 466.—**Sixth Step** (page 466).

HIGH AMPUTATION OF THE CERVIX.

FIFTH STEP.—Two or three additional silkworm-gut sutures are passed through the vaginal wall, the loose connective tissue, and the cervix on each side

of the original sutures in order to cover the stump, as in the operation of simple amputation (see p. 461).

Sixth Step.—The sutures are shotted, and the vagina irrigated with a solution of corrosive sublimate (1 to 2000), followed by normal salt solution. The parts are then dried; a narrow strip of gauze packed in the cervical opening; a loose tampon placed against the cervix; and the vulva protected with a compress secured by a T-bandage (Fig. 466).

After-treatment.—The strip of gauze in the cervical canal and the vaginal tampon are removed in forty-eight hours and not introduced again, and the vagina is then irrigated daily with a solution of corrosive sublimate (1 to 2000), followed by normal salt solution. The douches are continued until the patient gets out of bed, and then a daily irrigation of hot normal salt solution is given for several weeks.

The sutures are removed on the eighth day.

The care of the bladder and bowels; the regulation of the diet; and the relief of restlessness and pain are described under the After-treatment of Dilatation and Curetment of the Uterus on page 960.

Getting Out of Bed.—The patient should remain in bed for ten days and be allowed to go out at the end of the second week.

Anterior and Posterior Colporrhaphy.—The technic of these operations is described on pages 251 and 802.

The operations, as stated above, are indicated when the relaxation of the vaginal walls is marked or is not benefited by the decreased weight of the uterus after the cervix has been amputated. The operations should not be performed for at least one month after the amputation, and, if necessary, a hysterorrhaphy should be done at the same time.

Hysterorrhaphy.—The technic of the operation is described under the treatment of uterine prolapse on page 331.

The operation is only indicated in cases in which the relaxation of the parts is so great that the uterus cannot be supported by an anterior and posterior colporrhaphy alone.

INFRAVAGINAL HYPERTROPHY.

Synonym.—Hypertrophic elongation of the vaginal cervix.

Definition.—A true hypertrophy of the cervical tissues below the junction of the cervix with the vagina.

Causes.—The hypertrophy is always congenital and is met only in virgins and sterile women. It is a very rare condition, and even when present the enlargement is seldom sufficient to cause symptoms.

Pathologic Changes.—As stated above, the elongation is due to a true hypertrophy of the normal cervical tissue, which may be very slight in some cases and in others the overgrowth may be so great that the cervix protrudes from the vulvovaginal orifice. The hypertrophy results more in a lengthening of the vaginal cervix than in an increase in thickness, and in most cases its diameter is but little, if any, greater than normal.

Symptoms.—Moderate degrees of hypertrophy cause no symptoms. The accompanying stenosis of the cervical canal and the change in the position of the cervix may interfere with impregnation and thus tend to cause sterility.

In well-marked cases, on the other hand, sterility nearly always exists, and sexual intercourse is seriously interfered with by the presence of the enlarged cervix. When the organ protrudes from the vulvovaginal orifice, locomotion is more or less difficult and the exposed cervix is likely to become inflamed from the constant irritation and friction to which it is exposed.

Diagnosis.—The patient is examined in the dorsal and knee-chest positions by (*a*) sight and (*b*) touch.

Sight.—With the patient in the dorsal position nothing is observed externally unless the cervix protrudes from the vulvar orifice. Introducing a speculum into the vagina and retracting the perineum, the cervix is seen to be enlarged and conical in shape. Placing the woman in the knee-chest posture and reintroducing the speculum, the cervix is again exposed to view and found to be the same length as when the examination was made in the dorsal position. This is a most important point in the examination, as the cervix becomes much shorter in prolapse of the uterus when seen with the patient in the knee-chest position. The reason for this is that in prolapse as the uterus descends the vault of the vagina is

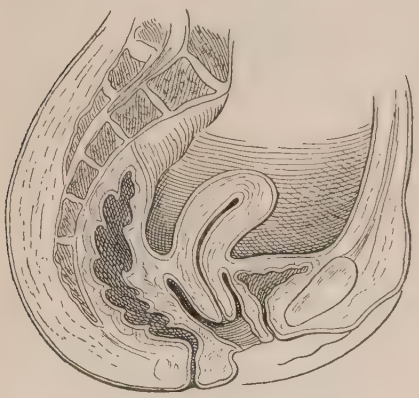


FIG. 467.

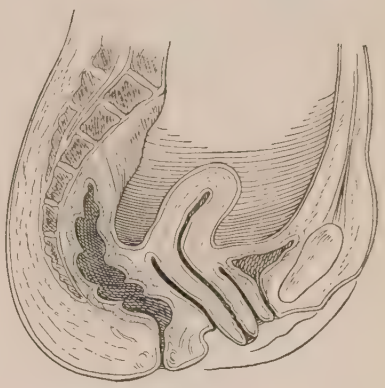


FIG. 468.

INFRAVAGINAL HYPERTROPHY OF THE CERVIX.

pulled down closely against the supravaginal cervix, giving the appearance of elongation to the infravaginal portion, which does not exist in reality. Upon placing the patient in the knee-chest position and introducing a speculum air rushes into the vagina; the uterus falls back; the tension upon the vaginal vault is relieved; and the apparent elongation of the cervix disappears.

Touch.—The examination is made with the patient in the dorsal position. Vaginal touch reveals an elongated and conical cervix. The dome of the vagina is not obliterated or drawn down, as in prolapse, and the fundus of the uterus is found to be in its normal position.

Differential Diagnosis.—Hypertrophy of the cervix must be distinguished from prolapse of the uterus. The diagnosis is made as follows (Figs. 469, 470, 471, and 472):

HYPERTROPHY OF THE CERVIX.	PROLAPSE OF THE UTERUS.
1. Occurs in virgins and in sterile women.	1. Occurs in women who have borne children.
2. No evidence of traumatism in the cervix or perineum.	2. Cervix and perineum usually lacerated.
3. Cervix elongated and conical.	3. Cervix apparently elongated but not conical.
4. Knee-chest position does not lessen the length of the cervix.	4. Knee-chest position causes the apparent elongation to disappear.
5. Dome of the vagina is normal.	5. Dome of the vagina is obliterated.
6. No relaxation of the vaginal walls.	6. Rectocele and cystocele.
7. Fundus of the uterus in normal position.	7. Fundus lower than normal.

Prognosis.—A cure can only be effected by surgical measures. The operative results are invariably satisfactory.

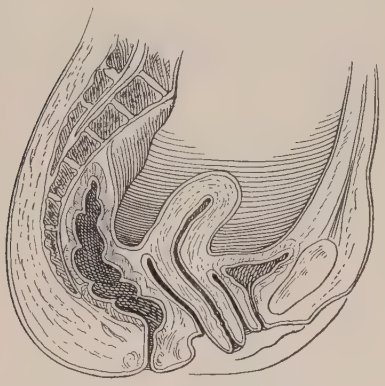


FIG. 469.—Hypertrophy.

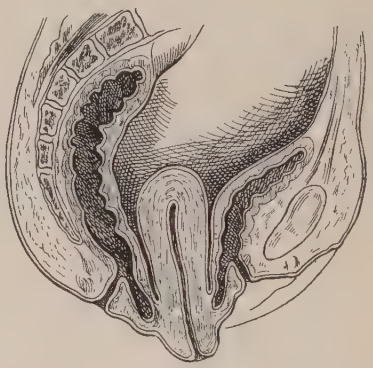


FIG. 470.—Prolapse.

DIFFERENTIAL DIAGNOSIS BETWEEN INFRAVAGINAL HYPERTROPHY OF THE CERVIX AND PROLAPSE OF THE UTERUS (page 467).

Showing the difference in the relations of the pelvic structures.

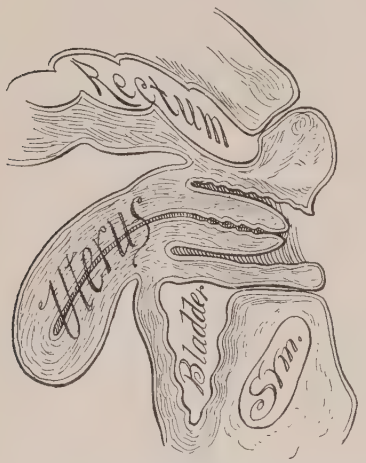


FIG. 471.—Hypertrophy.

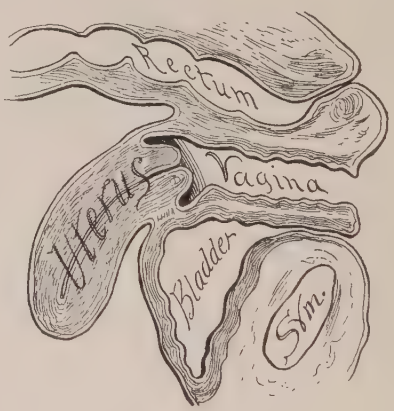


FIG. 472.—Prolapse.

DIFFERENTIAL DIAGNOSIS BETWEEN INFRAVAGINAL HYPERTROPHY OF THE CERVIX AND PROLAPSE OF THE UTERUS (page 467).

Fig. 471 shows that the knee-chest position does not lessen the length of the cervix; Fig. 472 shows that the knee-chest position causes the apparent elongation of the cervix to disappear.

Treatment.—The treatment consists in the removal of the elongated cervix by amputation as described on page 459.

APPARENT HYPERTROPHY.

In this form of hypertrophy there is an apparent but not an actual elongation of the vaginal cervix. The condition is caused by the altered relations that exist between the uterus and the vault of the vagina in cases of uterine prolapse. Under these circumstances, as stated elsewhere, the vaginal vault is pulled down by the descending uterus and lies close against the supravaginal cervix, producing the effect of elongation in the infravaginal portion.

Apparent hypertrophy of the cervix is merely one of the physical signs of prolapse of the uterus, and the reader is referred to that affection for a detailed discussion of the subject (Figs. 351 and 352).

CERVICAL POLYPI.

Varieties.—The following are the most common forms of cervical polypi:

Mucous Polypi.
Fibroid Polypi.
Warty or Papillary Growths.

Mucous Polypi are the most frequent of all the varieties. They develop from the glands of the intracervical mucosa and are the result of inflammation. The mouths of the ducts become obliterated; distention occurs; the small enlargements become constricted; and the polypoid masses project from the surface of the mucous membrane. Sometimes mucous polypi grow to a large size and protrude in a mass from the external os uteri.

Fibroid Polypi are not nearly so common as the mucous variety. They occur singly, as a rule, and begin as a small interstitial fibrous mass in the cervix, which gradually projects into the cervical canal and eventually becomes pedunculated. The pedicle is usually long and slender and the polypus often escapes from the cervical canal and hangs suspended in the vagina by its stalk.

Warty or Papillary Growths are not common, but they are occasionally found in the lower part of the cervical canal near the external os uteri and present the usual appearance of such growths elsewhere.

Symptoms.—The symptoms are not distinctive. The most important are:

Leukorrhea.
Menstrual disturbances.
Uterine hemorrhage.

Leukorrhea is a more or less constant symptom and is due to an inflammation of the intracervical mucous membrane which usually accompanies polypoid growths. The character of the discharge is the same as in uncomplicated cases of endocervicitis, unless the canal becomes infected or the polypus protrudes into the vagina, in which case it becomes very profuse, purulent, and offensive.

Menstrual Disturbances are common, and manifest themselves in the form of menorrhagia or dysmenorrhea. The presence of the growth causes irritation which results in uterine congestion, and hence the menstrual flow is often prolonged in duration and increased in amount. For the same reasons the monthly congestion of menstruation is accentuated and dysmenorrhea is a common symptom.

Uterine Hemorrhages are a more or less constant symptom. Sometimes the bleeding is slight and may follow active exertion, straining at stool, or sexual intercourse, and in other cases it may be so profuse and persistent that acute anemia results and the patient's skin becomes pale and waxy in appearance.

Diagnosis.—The patient is placed in the dorsal position and examined by (*a*) sight and (*b*) touch.

Sight.—If the polypus protrudes from the external os uteri or hangs suspended in the vagina it can readily be seen through a speculum, but when it occupies the upper or middle third of the cervical canal its presence cannot be detected until the cervix is dilated in order to determine the cause of the symptoms. The external os uteri and the cervical canal, however, are found to be dilated, and there is frequently an area of erosion on the cervix which is due to the irritation of the leukorrheal discharge.

Touch.—The polypus is easily detected by the examining finger when it protrudes from the cervix or hangs in the vagina, but if it is situated high up in the cervical canal and cannot be palpated the characteristic gaping of the external os is the only physical sign present.

Differential Diagnosis.—Cervical polypi, unlike uterine tumors of the same nature, do not, as a rule, attain a large size, and hence they are seldom mistaken for other conditions, as their relations with the surrounding parts are not obscured by their large bulk. Sometimes, however, a cervical polypus may continue to grow until it fills the vagina, and it then becomes necessary to distinguish it from an *Inversion of the Uterus* (see p. 362).

The question of malignancy must always be borne in mind in cases of cervical polypi, especially when the growth occupies a high position in the cervical canal and cannot be detected by sight or touch. Under these circumstances an exploratory dilatation and curetment of the uterus must be performed in order to discover the origin of the symptoms and exclude the possibility of cancer of the cervix.

Another routine rule of practice which must always be observed is to examine microscopically every polypus that is removed, otherwise the malignant character of some of these growths may be overlooked and the opportunity for an early hysterectomy lost.

Prognosis.—There is always danger of malignant degeneration occurring in a cervical polypus, and hence it should be excised at once. If the tumor is benign in character, the prognosis is good, and it does not return after removal. A spontaneous cure may take place at times as the result of the pedicle becoming constricted and the tumor sloughing off.

Treatment.—The treatment in every case is surgical and consists in the removal of the growths. (See Treatment of Uterine Polypi, p. 387.)

EVERSION OF THE INTRACERVICAL MUCOSA.

Causes.—Ectropion of the intracervical mucous membrane may arise from the following causes:

Traumatism.
Congestion and inflammation.
Congenital defect of the external os uteri.

Traumatism.—This is the most frequent cause of eversion and is due to exposure of the intracervical mucosa by a laceration of the cervix. This variety is fully discussed under lacerations of the cervix on page 451.

Congestion and Inflammation.—A large number of cases of eversion are due to long-continued congestion or inflammation which causes the mucosa to become swollen and gradually dilate the cervical canal. In time the external os becomes patulous and the thickened endometrium, not finding sufficient room within the canal, bulges toward the point of least resistance and protrudes beyond the cervical canal.

Endocervicitis is a more or less frequent cause of this variety of ectropion, which is especially liable to occur when the cervical inflammation is associated with a pelvic tumor that interferes by pressure with the return circulation in the pelvis. Again, I have also observed a number of these cases in young women who were engaged to be married and in whom the pelvic organs were congested from "the sexual engorgement in love-making." And, finally, certain vicious habits, such as checking the menstrual flow with cold-water douches and the use

of condoms in sexual intercourse, as well as other similar practices, are very apt to cause congestion of the uterus, which may eventually be followed by eversion of the cervical mucosa.

Congenital Defect of the External Os Uteri.—In this variety of eversion the intracervical mucous membrane, which normally stops at the external os uteri, is continued and spreads over the outer aspect of the cervix. This abnormal extension of the glands and the epithelium lining the cervical cavity results from an embryonic defect in the development of the muscular fibers of the lower segment of the cervix, which fail to contract and enclose the entire canal.

Symptoms.—The symptoms depend upon the cause and extent of the eversion.

The local and general manifestations of traumatic ectropion are discussed on page 451 and need not be referred to here.

The displacement is usually very limited in cases of congenital and inflammatory eversions, and hence it gives rise to no characteristic symptoms. When, however, the eversion is marked, the exposure of the mucous membrane to the acid secretions of the vagina and to friction against the vaginal walls produces an inflammation of the glandular structures which results in hypersecretion. These cases, therefore, have more or less leukorrheal discharge and the symptoms are similar to those caused by a deep bilateral laceration of the cervix.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.
The microscopic examination.

The traumatic variety of ectropion will not be considered.

The History.—There is usually no history of a previous labor. A careful inquiry should be made as to the existence of any causes of pelvic congestion or inflammation and a note made of those which are likely to result in cervical ectropion.

Symptoms.—The symptoms are not distinctive and in some cases they may be absent altogether.

Physical Signs.—The patient is placed in the dorsal position and examined by (*a*) sight and (*b*) touch.

Sight.—In slight eversion the shape of the cervix is normal and a granular area is seen surrounding the os uteri. When the everted mucous membrane covers a large surface, as is sometimes the case in the congenital variety, the cervix becomes club-shaped at its extremity and its upper part is constricted, giving it the appearance of a pedicle.

The everted mucous membrane has a granular or eroded appearance which is not readily distinguished from a true erosion unless cystic degeneration is present in some of the glands, which would positively prove the existence of eversion. In granular conditions of the cervix the presence of an eversion of the intracervical mucosa should always be suspected when there is no history of a previous pregnancy or when the parts show no evidence of traumatism. Cervical erosions due to congenital eversion have been found in a large number of new-born infants.

Touch.—By vaginal touch we are able to recognize the soft, velvet-like area of eversion surrounding the external os; the presence of Nabothian cysts; the shape of the cervix; and the absence of any evidence of laceration.

The Microscopic Examination.—If it is necessary to confirm the diagnosis, a wedge-shaped piece should be excised from the cervix and sent to a pathologist for a microscopic examination.

Differential Diagnosis.—Eversion of the cervical mucosa must be distinguished from the following conditions:

Ectropion with laceration of the cervix.
Malignant disease of the cervix.

Ectropion with Laceration.—This variety of eversion occurs in women who have borne children. The physical signs of laceration are present; the cervix is enlarged and indurated; its extremity is club-shaped; the angles of laceration are recognized by sight and touch; and the hard plug of cicatricial tissue at the bottom of the tear is readily felt by the examining finger. The cervical canal is distinctly traced on the anterior and posterior lips as a clearly defined strip of mucous membrane which disappears from view when the shape of the cervix is restored by bringing the everted parts together with crossed tenaculums (Fig. 437).

Malignant Disease of the Cervix.—The microscope must be relied upon to distinguish between the early stage of cancer or sarcoma of the cervix and the so-called erosions that are caused by eversion of the cervical mucosa. In the later stages of malignant disease the physical signs are characteristic and a mistake could hardly be made. An early diagnosis is imperative from the standpoint of radical treatment, and it is therefore necessary to view all cervical erosions with suspicion.

Prognosis.—The affection is readily cured, as a rule, by appropriate treatment.

Treatment.—The treatment is based upon the following causes:

Traumatism.
Congestion and inflammation.
Congenital defect of the external os uteri.

Traumatism.—The treatment of this variety is discussed under Lacerations of the Cervix on page 452.

Congestion and Inflammation.—The eversion in these cases is always secondary to a local or general condition, hence we must first discover the primary cause and then remove it, and at the same time apply treatment directly to the everted mucous membrane itself. As stated elsewhere, the affection is primarily caused by an endocervicitis and the swollen mucosa is eventually forced through the os uteri. The cause of the inflammatory condition must be sought for and treated upon the principles laid down in the management of that disease. We must also bear in mind the rôle played by vicious habits and long engagements in the etiology of cervical congestion and ectropion, otherwise no beneficial results will follow the treatment.

As the endocervicitis or congestion is relieved the mucous membrane diminishes in thickness and the everted portion gradually retracts within the cervical canal. This result is materially hastened and assisted by the following local plan of treatment:

1. A douche of one gallon of hot normal salt solution (110° F.) is used every night and morning with the patient in the recumbent position. Before going to bed a cotton-wool tampon saturated with ichthyol and glycerin (25 per cent.) is introduced into the vagina and removed on the following morning.

2. From one-half to an ounce or more of blood is removed from the cervix twice a week with a sharp bistoury (see Endometritis, p. 423), and at the same time the everted portion of the mucous membrane is scarified by a number of superficial parallel incisions which are crossed by others at a right angle. (See Lacerations of the Cervix, p. 454.) The entire cervix and the vaginal vault are

then painted with tincture of iodin and a tampon of ichthyol and glycerin (25 per cent.) introduced into the vagina.

All local treatment must be discontinued during the menstrual periods.

The removal of the cause combined with the local treatment usually results in a complete cure of the eversion. But if it still persists and is limited in extent, the mucous membrane with its glandular elements must be destroyed by the actual cautery. When, however, the eversion is marked, radical measures must be instituted and the lower third of the cervix amputated.

Operation of Cauterization.—No preliminary preparation is required and an anesthetic is unnecessary.

The patient is placed in the dorsal position and the cervix exposed with a speculum. The anterior and posterior lips are then seized with bullet forceps and drawn down toward the vulvar opening. The everted mucous membrane surrounding the os uteri is now deeply seared with the platinum point of a Paquelin cautery or a pointed piece of steel heated to a red-heat and the wound dressed by placing a cotton-wool tampon covered with iodoform ointment (U. S. P.) against the cervix. The tampon is removed every twenty-four hours and reapplied after the vagina has been irrigated with a hot normal salt solution (110° F.). The wound generally heals in about one week, and in the meantime the patient is allowed to attend to her usual duties.

Congenital Defect of the External Os Uteri.—The eversion in this variety being due to an embryonic deficiency in the lower portion of the cervical canal, it naturally follows that treatment will not cause the displacement to retract, and hence it must be destroyed by the cautery or removed by amputation of the lower third of the cervix.

ACQUIRED ATRESIA OF THE CERVIX.

Definition.—A complete closure of the cervical canal due to acquired causes.

Pathologic Changes.—An atresia of the cervix prevents the escape of the menstrual blood and uterine secretions, which gradually accumulate within the cavity of the uterus and produce the following conditions: *Hematometra*, or a collection of blood within the uterus; *hydrometra*, or a collection of mucus; *pyometra*, or a collection of pus; and *physometra*, or a collection of gases.

The uterus rarely attains a larger size than that of an orange and its walls either become distended and thinner than normal or they take on hypertrophy and increase in thickness, as in pregnancy.

If the distention of the uterine cavity is marked, the Fallopian tubes also become involved and a *hematosalpinx*, a *hydrosalpinx*, or a *pyosalpinx* is developed.

Causes.—Atresia of the cervical canal may be caused by ulcerative adhesions or pressure in cases of cancer of the cervix; a faulty technic in operations upon the cervix; and cicatrices and adhesions from sloughs occurring during labor or from the application of acids or the actual cautery. An ill-fitting pessary may cause inflammation and subsequent closure of the cervix. Ulcerative changes may also occur during an attack of diphtheria, scarlet fever, or smallpox, and close the external os uteri. And, finally, adhesive inflammation may occur in women who have passed the menopause and obliterate the cervical canal.

Hematometra occurs, as a rule, in women before the menopause, and is due to damming-up of the menstrual blood. *Hydrometra* is most frequently met in old women who have passed the climacteric, and *pyometra* is comparatively common in cancer of the cervix, but is rare in cases in which the malignant disease is situated in the body of the uterus. *Physometra* occurs most often in connection with pyometra, and is due to the development of gases in the pus.

Symptoms.—The symptoms of atresia depend upon the age of the patient and the character of the contents of the distended uterus.

After the climacteric the affection does not give rise to symptoms because the uterine glands are inactive and the menstrual flow is absent, and hence there are no fluids to be dammed up and distend the cavity of the uterus. In young women, however, atresia of the cervical canal gives rise to amenorrhea and other well-marked local and general symptoms that are caused by the retention of the menstrual blood within the uterine cavity.

In cases of *hydrometra* the symptoms are entirely local and the patient complains of a sensation of weight and fullness in the pelvis which is accompanied by more or less backache. The intensity of the symptoms naturally depends upon the amount of uterine distention, and in some cases it may be so great as to cause marked local distress.

In *pyometra* the contents of the uterine cavity are infected and, in addition to the local symptoms caused by the presence of the enlarged uterus, the patient develops a more or less active type of septicemia.

Physometra is associated with pyometra and the symptoms are similar.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.

The History.—The statements of the patient may point to one of the causes of acquired atresia, and she may have had an operation upon the cervix or some form of intrauterine treatment, or there may be a history of a vaginal inflammation occurring with an attack of diphtheria, scarlet fever, or smallpox. The age of the patient is also important, as hematometra usually occurs prior to the menopause and hydrometra is generally an affection of old age.

The Symptoms.—Amenorrhea accompanied by a menstrual molimen is significant of the presence of atresia. The local symptoms produced by the pressure of the distended uterus upon the pelvic organs are of no diagnostic value, as they accompany all forms of uterine enlargement. General septic infection points to the purulent character of the uterine accumulation when the atresia and distention have been recognized.

The Physical Signs.—The patient is placed in the dorsal position and examined by (*a*) touch and (*b*) sight.

T o u c h .—The examination is made by *vaginal touch*, *vagino-abdominal palpation*, and the *uterine sound*.

Vaginal touch and vagino-abdominal palpation reveal a round, symmetric, elastic tumor, and if the uterine walls are distended and thinner than normal, fluctuation may be elicited; but if the muscular coat of the uterus has become hypertrophied, it is difficult to recognize the cystic nature of the enlargement.

If there is an obstruction at the internal and also one at the external os, the cervical and uterine cavities are distended separately and the tumor becomes constricted at or near its center.

In cases of marked uterine distention a round elastic tumor may be felt through the abdominal wall above the symphysis, and if the uterus contains gas (*physometra*) a tympanitic note will be elicited upon percussion over the enlargement.

The examination with the uterine sound should be made by sight under the influence of an anesthetic and with strict antiseptic precautions. A speculum is introduced into the vagina and the anterior and posterior lips of the cervix seized with bullet forceps. A careful examination is then made of the cervical canal with the sound and the situation of the obstruction located.

Sight.—An examination through a speculum reveals nothing unless the obstruction is situated at the external os uteri, in which case the closure of the opening may be seen and the diagnosis confirmed.

Differential Diagnosis.—Atresia of the cervix resulting in distention of the uterine cavity must be distinguished from pregnancy and fibroma of the uterus.

In *pregnancy* the usual subjective and objective signs are present and there is no history, as a rule, of amenorrhea prior to gestation.

A *fibroid tumor* is usually accompanied by menorrhagia or metrorrhagia or both, and the enlarged uterus is hard, nodular, and inelastic. An examination with the uterine sound reveals a patulous cervical canal.

Prognosis.—As a rule, the affection runs a chronic course. Pyometra, however, endangers life from septic infection, and the prognosis becomes very grave if the oviducts are involved. Occasionally in physometra the confined gases break through the obstruction and a spontaneous cure results.

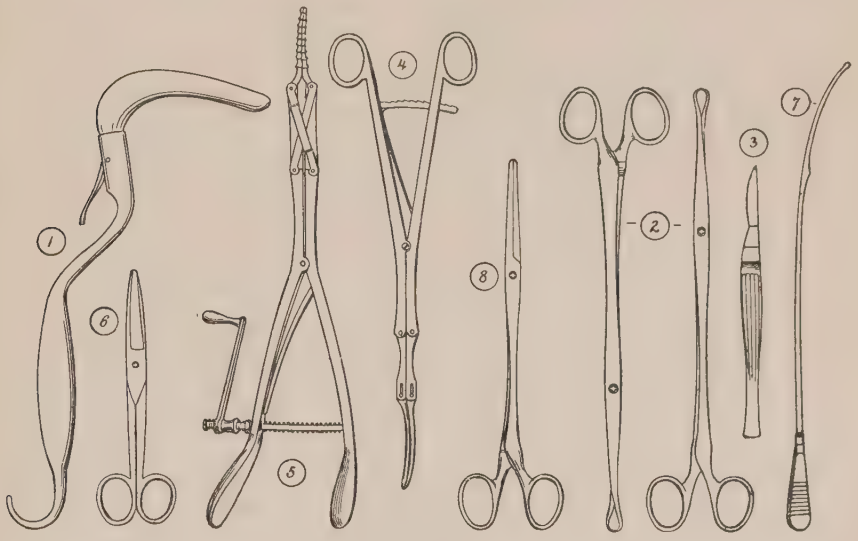


FIG. 473.—INSTRUMENTS USED IN THE OPERATION FOR THE REMOVAL OF AN ACQUIRED OBSTRUCTION IN THE CERVICAL CANAL.

The results following operative measures are usually good and the patient generally recovers unless she is septic at the time of operation (*pyometra*).

Treatment.—The indications for treatment are as follows:

To remove the obstruction.

To keep the canal patulous.

To relieve the complications.

To Remove the Obstruction.—This is the essential factor in the treatment and is accomplished by the operation of *Divulsion and Incision.*

Technic of the Operation.—The *Preparation of the Patient* and *Preparations for the Operation* are described on pages 830 and 831.

Position of the Patient.—Dorsal position.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Instruments.—(1) Simon's speculum (curved blade); (2) two bullet forceps; (3) straight narrow bistoury; (4) light uterine dilator; (5) heavy uterine dilator; (6) straight scissors; (7) uterine sound; (8) dressing forceps.

Operation.—The speculum is introduced into the vagina and the anterior and posterior lips of the cervix seized with bullet forceps and pulled down toward the vulvar orifice.

If the obstruction can be seen at the external os, it is incised with the straight bistoury and the cervical canal stretched with the heavy dilator to the extent of from one to one and a half inches. When the occlusion is higher up in the cervical canal and cannot be seen, the obstruction may usually be overcome by divulsion alone. Under these circumstances the light or heavy dilator is passed up into the cervical canal until the tip of the blades meets the obstruction. The cervical cavity is then forcibly dilated by squeezing the handles of the instrument together with the right hand and the cervix steadied by the lower bullet forceps, which is held in the left hand. The pressure upon the handles is then relaxed and the blades allowed to come together again, when an attempt is made to pass the instrument higher up into the canal. Each successive dilatation tears apart some of the tissues at the point of occlusion, until finally the obstruction is completely overcome and the instrument passes into the uterine cavity. The cervix is then stretched with the heavy dilator to the extent of from one to one and a half inches and the instrument withdrawn.

The uterine cavity is now irrigated with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, and the vagina dried. The uterine cavity and the cervical canal are then packed with a narrow strip of gauze and the vulva protected with a compress secured by a T-bandage.

Variations in Technic.—In cases of pyometra the uterine mucosa is infected and the uterus should be cureted after the pus is evacuated. (For the list of instruments see Dilatation and Curetment of the Uterus, p. 955.)

When a high obstruction cannot be overcome by divulsion alone, it should be punctured by a sharp bistoury and then stretched with the heavy dilator. Care must be taken to keep the blade of the bistoury in the line of the canal, otherwise it may penetrate the walls of the cervix and injure the adjacent structures.

After-treatment.—*Care of the Cervical Canal.*—At the end of forty-eight hours the patient is placed in the dorsal position either on the edge of the bed or upon a table and the gauze packing carefully removed from the uterus. The vaginal canal is then irrigated with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution, the speculum introduced, and the vagina dried with gauze sponges. The anterior and posterior lips of the cervix are then seized with bullet forceps and the cervical canal packed tightly with a strip of gauze. The dressing is renewed in the same manner every second day while the patient remains in bed.

In cases of pyometra it may be necessary to remove the gauze packing from the cervix every twenty-four hours and flush the uterine cavity with corrosive sublimate and normal salt solution before reintroducing it. The indications in each case, however, must be our guide, and if the patient has no elevation of the temperature or pulse and there is no foul discharge coming from the uterus, the uterine flush should not be employed.

The *care of the bladder and bowels*, the *regulation of the diet*, and the *relief of restlessness and pain* are discussed under the After-treatment of Dilatation and Curetment of the Uterus, on page 960.

Getting Out of Bed.—The patient should remain in bed one week.

The Subsequent Treatment.—When the patient gets out of bed, she should use a vaginal douche of hot normal salt solution (two gallons) night and morning for several weeks.

An examination of the cervical canal should be made every four weeks for a period of several months, and if the atresia recurs the cervix must again be dilated.

To Keep the Cervical Canal Patulous.—This indication has been considered under after-treatment.

To Relieve the Complications.—The tubal complications may, at times, require treatment, and if the oviducts remain distended after the uterine cavity has been emptied, it may be necessary eventually to consider the question of their removal. (See Diseases of the Fallopian Tubes.)

ACQUIRED STENOSIS OF THE CERVIX.

Definition.—A narrowing or stricture of the cervical canal due to acquired causes.

Pathologic Changes.—The constriction interferes with free drainage from the uterine cavity and cervical canal and the secretions and menstrual blood are temporarily dammed up. Endocervicitis and endometritis are frequently caused by stenosis and the hypertrophied and swollen intracervical mucosa aggravates the trouble by increasing the tightness of the stricture.

Causes.—The affection may be due to uterine displacements and also to any of the causes that produce atresia. Anteflexion is the most common cause of cervical stenosis, and as it is usually associated with endocervicitis, the swollen condition of the mucous membrane increases the constriction at the point of flexion and produces a very tight stricture.

Symptoms.—The following are the chief symptoms:

Leukorrhea.
Painful menstruation.
Paroxysmal bearing-down pains.
Sterility.

Leukorrhea.—Congestive endometritis and endocervicitis are usually associated with stenosis and the discharge has the distinctive characteristics of the uterine and cervical secretions. As a rule, the leukorrhea is slight in amount and non-irritating, and unless the uterine cavity becomes infected, it is free from pus.

Painful Menstruation.—The obstruction in the cervical canal prevents the free escape of the menstrual blood, which is temporarily dammed up within the uterine cavity and paroxysmally expelled by painful contractions of the uterus. This condition is known as *obstructive dysmenorrhea* and is fully discussed on page 721.

Paroxsymal Bearing-down Pains.—This is a very rare symptom, and is due to the expulsion of the mucus which has accumulated above the point of stricture in cases in which the stenosis is near the external os uteri and the cervical cavity above is distended by the retained secretions.

Sterility.—Sterility is common in cases of marked anteflexion and conception usually promptly occurs after the deformity has been removed. The inability upon the part of the uterus to become impregnated is not due so much to the obstruction preventing the entrance of spermatozoa as it is to the structural changes that are present in the corporeal endometrium which render it unfit to receive and mature the ovum.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The physical signs.

The History.—The statements of the patient may point to one of the causes of stenosis. The age of the patient is important because narrowing of the cervical canal, as a rule, has no symptomatic significance after the menopause, and a

previous pregnancy would practically exclude anteflexion, as this displacement is most often met in sterile women.

The Symptoms.—Painful menstruation associated with sterility and leukorrhea would probably indicate the presence of some form of mechanic obstruction in the cervical canal.

The Physical Signs.—The patient is placed in the dorsal position and examined by (*a*) touch and (*b*) sight.

The diagnosis of anteflexion is discussed on page 338.

Touch.—The examination is made by *vaginal touch, vagino-abdominal palpation,* and the *uterine sound.*

When the obstruction is situated at the external os, the examining finger may recognize that the opening is contracted, and if the cervical canal has become sufficiently dilated to change the shape of the cervix, it will be more or less globular in form and the tissues will be soft and elastic.

The examination with the uterine sound should be made by sight under the influence of an anesthetic and with strict antiseptic precautions. A speculum is introduced into the vagina and the anterior and posterior lips of the cervix seized with bullet forceps. The uterine sound is then passed into the cervical canal and the situation of the obstruction located. If the canal is dilated from the presence of retained secretions, the tip of the sound moves freely in all directions after it passes the external os and emerges beyond the stricture.

Sight.—An examination through a speculum will reveal the small size of the os uteri and the globular shape of the cervix in cases of distention.

Prognosis.—The affection yields readily to treatment. The prognosis of obstructive dysmenorrhea is discussed on page 722.

Treatment.—The indications for treatment are as follows:

To dilate the stricture.

To cure the endometritis and endocervicitis.

Both of these indications are met by the operation of dilatation and curetment of the uterus, which is described on page 955.

CHANCRE OF THE CERVIX.

Description.—The primary lesion of syphilis is rarely found on the cervix, and occurs in that situation with about the same frequency as on the vagina. The sore occupies either the anterior or posterior lip; it is usually single, but may be multiple; its appearance does not differ in any way from that of a chancre on other parts of the genital tract; and in some cases the ulceration may extend into the cervical canal. The inguinal glands are not affected, but those within the pelvis are frequently involved and give rise to a lymphangitis or a lymphadenitis.

Diagnosis.—The diagnosis is based upon a physical examination; the history of a susp'cious intercourse; and the appearance of constitutional symptoms. The sore presents the usual characteristics of a chancre and pressure upon the vaginal vault may reveal the tender and swollen lymphatic vessels and enlarged glands. A positive opinion, however, should not be given until the specific nature of the sore is determined beyond doubt by the appearance of the secondary eruption, otherwise a mistake may easily be made and the patient placed upon a long course of treatment for the cure of a disease from which she is not suffering.

Treatment.—The patient should not be placed upon anti-syphilitic treatment until a positive diagnosis is made. In the meantime, however, the sore

should be treated as follows: Irrigate the vagina with a solution of corrosive sublimate (1 to 2000), followed by normal salt solution, and cauterize the sore with pure nitric acid. Then dust the ulcer with iodoform powder and pack the vagina with iodoform gauze. Fresh dressings should be applied daily until the sore heals.

HERNIA OF THE UTERUS.

Synonym.—Hysterocele.

Description.—The presence of the uterus in the sac of a hernia is a very rare condition. Cases have been reported, however, in which the uterus was found in the sac of a crural and an inguinal hernia, and in two instances impregnation occurred and gestation advanced up to the fourth month.

Diagnosis.—The physical examination demonstrates the absence of the uterus from the pelvic cavity and the presence in the hernial sac of a firm body having the general outline of the organ and moving slightly when strong pressure is made upon the vaginal vault.

Treatment.—If the uterus is unimpregnated, a radical operation for the cure of the hernia should be performed and the displaced organ returned to the pelvic cavity. Sometimes the local changes that occur in and about the sac of an old hernia prevent the replacement of the uterus, and it may be necessary, therefore, to remove it. If the uterus is impregnated, hysterectomy should be performed and the hernia relieved by a radical operation.

CHAPTER XVII.

EXAMINATION OF THE FALLOPIAN TUBES, THE OVARIES, AND THE UTERINE LIGAMENTS.

These organs can be examined by the following methods:

Vagino-abdominal touch.
Recto-abdominal touch.
Artificial uterine prolapse.

Limitations.—The Fallopian tubes, the ovaries, and the uterine ligaments can be more or less thoroughly palpated. In thin women there is no difficulty whatever in recognizing and outlining the different organs, but in women who are muscular or fat and in patients who have gross inflammatory pelvic lesions where the organs are matted together and bound down by lymph it is often difficult or impossible to separate one organ from another. In these cases, therefore, the diagnosis depends upon the experience of the examiner and his ability to estimate the pathologic significance of the lesions which are recognized by touch. Again, even an expert gynecologist must at times be contented to simply find a pelvic mass without being able to acquire any positive information as to its origin or character.

Information.—By these methods of examination we can palpate the normal organs and also recognize the various diseases with which they may be affected.

Preparation of the Patient.—The rectum should be emptied by an enema of soapsuds and warm water and the urine voided naturally just before

the examination. The corset should be removed and all clothing that restricts the waist should be loosened.

Position of the Patient.—The dorsal is the best position in which to place the patient in making the different examinations. An examination cannot be satisfactorily made in the lateral-prone position, as it is awkward for the examiner, and besides the organs sink back beyond the reach of the fingers.

Anesthesia.—In very thin women it may be possible to make a satisfactory examination without the use of an anesthetic, but, as a rule, it should always be employed, otherwise mistakes are likely to be made in the diagnosis which may subsequently be corrected by another examiner who is more thorough in his methods. An anesthetic should usually be employed when the uterus is pulled down toward the vaginal outlet (*artificial uterine prolapse*) to facilitate the examination of the organs.

VAGINO-ABDOMINAL TOUCH.

Indications.—This method of examination is particularly useful in palpating the tubes and the ovaries when the uterus is in its normal position. It can also be employed to examine the round, broad, and uterosacral ligaments and the space between the uterus and the bladder. When the uterus and its appendages are retrodisplaced, valuable information can often be obtained by this method, but it should always be supplemented, however, by recto-abdominal touch, which gives a more accurate knowledge of the pathologic lesions under these conditions.

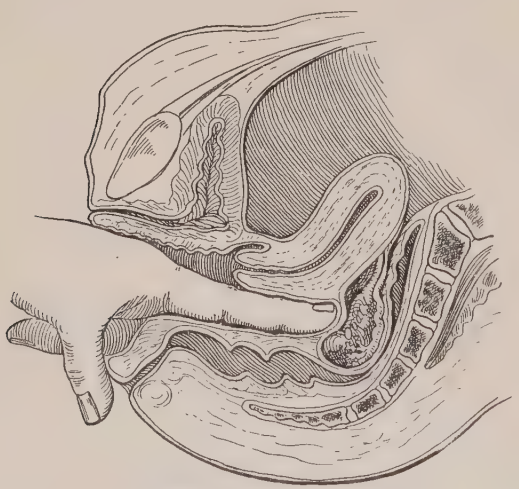


FIG. 474.—PALPATING AGAINST THE PELVIC WALL AN OVARY WHICH IS SITUATED IN THE CULDESAC OF DOUGLAS.

Technic.—The examiner sits or stands in front of the vulva and introduces the index-finger up to the cervix. The tip of the finger is then pressed upward against the cervix to test the mobility of the uterus and to ascertain the presence or absence of tenderness in the uterosacral ligaments and the pelvic cavity (Fig. 304).

The finger is now passed gently but firmly around the cervix to determine whether the vaginal vault is normal or obliterated, or whether there is an enlargement at the base of the broad ligaments, and to note any contraction of the tissues at the sides of the pelvis.

Next the finger is pressed posterior to the cervix and the culdesac of Douglas carefully palpated. Sometimes a prolapsed and enlarged ovary or tube can be felt in this situation, which may be clearly outlined against the pelvic wall by gently stroking it. A prolapsed normal ovary may sometimes be felt posterior to the uterus, and is recognized as a round, movable, little mass which constantly slips away from the tip of the finger as it is palpated against the pelvic wall.

Having completed the examination with one finger alone, the examiner now places the free hand on the abdomen just above the pubes and palpates the tubes, the ovaries, and the broad and round ligaments by the bimanual method. The right index-finger should be used in the vagina to palpate the right side of the pelvis, and the left index-finger the left side.

If the uterus is in its normal position, the internal finger is pressed lightly upon the fundus, while the external fingers dip downward through the abdominal wall from above. Having the fundus now under control, the fingers of both hands, still in contact, are slipped over the side of the uterus and the intervening structures carefully palpated in the direction of the lateral wall of the pelvis.

The normal Fallopian tube, which feels like a long, smooth, soft, rounded structure, cannot be recognized, as a rule, with certainty; but when it is diseased or enlarged, it forms a club-shaped mass which tapers toward the uterus.

The normal ovary can usually be felt and is recognized as a little body, some-

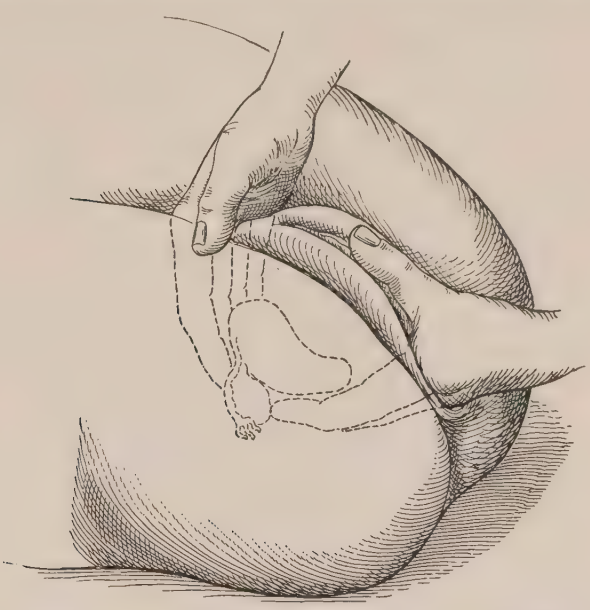


Fig. 475.—Examination of the Uterine Appendages by Vagino-abdominal Touch.

what the shape and size of a small olive, which is freely movable in all directions and constantly slips away from the fingers.

Sometimes the ovary and the tube are prolapsed and cannot be felt when the fingers slide off from the side of the uterus. Under these circumstances the internal finger is placed at the side of the cervix and the external fingers pressed down upon it. Keeping the fingers in contact so that none of the intervening structures can slip by without being recognized, they are gradually moved upward again to the side of the fundus of the uterus and out toward the pelvic wall. This manipulation usually enables the examiner to catch the appendages between the internal and external fingers, and if the maneuver fails, it should be repeated until they are finally recognized.

The round ligaments are felt anterior to the fundus by placing the internal finger in front and to the side of the uterus and forcing the structures downward upon it with the abdominal fingers. The normal ligament is very difficult to

palpate, as it is a relaxed cord-like structure which blends with the surrounding tissues and escapes recognition.

The anterior uterine space can be palpated by placing the internal finger back of the bladder and crowding the fundus of the uterus posteriorly with the external fingers. The fingers of both hands are then brought into close contact with each other, when any intervening growth can be easily caught and carefully examined.

Lesions of the broad ligament are easily recognized by placing the internal finger at the side of the cervix and making counter-pressure with the external hand. The examiner then slowly palpates the structures upward to the fundus of the uterus and laterally to the side of the pelvic cavity.

The uterosacral ligaments can usually be felt by making slight pressure upward back of the cervix, and at the same time pressing the fundus of the uterus toward the vaginal outlet with the abdominal fingers. The ligaments are then recognized as tense cords extending from the cervix to the sacrum.

When the uterine appendages are matted together by adhesions and inflam-

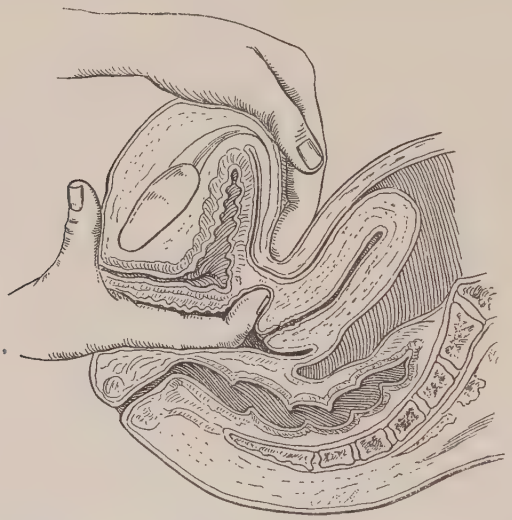


FIG. 476.—EXAMINATION OF THE ANTERIOR UTERINE SPACE BY VAGINO-ABDOMINAL TOUCH.

matory exudates, they lose their characteristic outlines and form a mass which is more or less firmly fixed in the pelvic cavity and which assumes a variety of different shapes.

If the uterus is retrodisplaced the appendages cannot be palpated as well by vagino-abdominal as by recto-abdominal touch. However, by pressing the internal finger somewhat posterior and to the left of the cervix and making counter-pressure through the abdominal wall, we can often distinctly feel and outline a tubal or an ovarian enlargement.

When it is necessary to make deep palpation with the internal finger, an advance of from one to three inches can be gained by firm pressure of the knuckles of the examining hand against the perineum (Fig. 20). If the examination is made without an anesthetic and there is difficulty in outlining the organs on account of muscular rigidity, the patient should take a deep inspiration, followed by a rapid expiration, which causes a short period of relaxation that can be taken advantage of by the examiner.

RECTO-ABDOMINAL TOUCH.

Indications.—This method of examination is particularly useful in palpating the tubes and the ovaries when the uterus or its appendages or both are retrodisplaced. Retrouterine tumors and other lesions occupying Douglas's culdesac can be distinctly felt through the rectum and their physical characteristics ascertained.

Technic.—The examiner sits or stands in front of the vulva and introduces the index-finger of the left hand into the rectum with the palmar surface directed upward. The finger is then carried high up in the rectum, and if the intestines are found crowding the pelvic organs it is withdrawn and the patient placed temporarily in the knee-chest position and air admitted into the vagina. The position of the patient is then slowly changed again to the dorsal posture and the intestines kept out of the pelvis by keeping the hips constantly higher than the abdomen while she is being turned on her back.

After again introducing the index-finger into the rectum the fingers of the free hand are placed over the abdomen above the symphysis and downward pressure is made in the direction of the promontory of the sacrum. The internal and external fingers are then brought in contact behind the uterus and the culdesac of Douglas carefully palpated, noting the absence or presence of diseased organs or inflammatory exudates. The rectal finger can be carried higher up in the pelvic cavity by making firm pressure with the knuckles of the examining hand against the anus and perineum (Fig. 88). The internal and external fingers are then passed on each side of the fundus uteri and a thorough examination made of the structures. The uterus is then caught between the examining fingers and the existence of inflammatory adhesions ascertained by the amount of mobility present.

ARTIFICIAL UTERINE PROLAPSE.

This method of investigation is fully described in discussing the examination of the uterus by artificial uterine prolapse on page 306.

CHAPTER XVIII.

THE FALLOPIAN TUBES.

MALFORMATIONS.

The following anomalies have been observed:

Absence of the tubes.	Supernumerary and accessory tubes.
Rudimentary tubes.	Accessory ostia.
Anomalies in size and shape.	Displacements.

Absence of the Tubes.—Absence of one or both Fallopian tubes is a very rare occurrence and is usually associated with some anomaly of the uterus. If both tubes are absent, the uterus is generally wanting; but if only one tube is lacking, the ovary is absent and the uterus is unicornate or one-horned.

Rudimentary Tubes.—One or both tubes may be defective or rudimentary in development and the corresponding ovaries ill-formed or absent altogether. Sometimes the rudimentary condition of the tubes is found to be

due to failure of canalization in the Müllerian ducts, which remain as solid cords either completely or partially obliterating the lumen of the oviducts and destroying their function.

Anomalies of Size and Shape.—The oviducts are sometimes greatly increased in size and length and occasionally one tube is found to be larger than the other. In other instances they may be contorted by a number of spiral convolutions which obliterate their caliber and cause sterility.

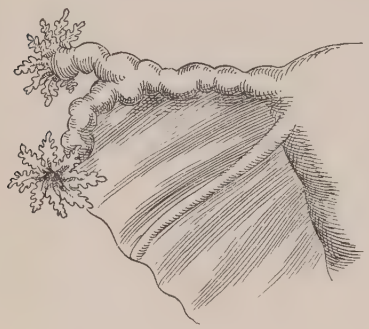


FIG. 477.—ACCESSORY TUBES.

FIG. 478.—ACCESSORY OSTIA.

Supernumerary and Accessory Tubes.—Supernumerary tubes are very rare and are usually associated with supernumerary ovaries. Accessory oviducts, on the other hand, are more or less commonly met, and are found attached either to the broad ligament or to the tube itself.

Accessory Ostia.—Accessory ostia are not uncommon and are generally located in the neighborhood of the abdominal openings of the oviducts.

Displacements.—A Fallopian tube may be displaced downward, backward, or upward, and cases have been noted in which it occupied the sac of a hernia.

DISEASES OF THE FALLOPIAN TUBES.

SALPINGITIS.

Definition.—An inflammation of the Fallopian tubes.

Causes.—Salpingitis is not only a common disease, but it is also, with very few exceptions, the only affection of the oviducts that interests the surgeon from a practical standpoint.

The disease is nearly always secondary to an infection of the uterus or the peritoneum, and the inflammation either spreads by continuity and contiguity of structures directly to the tubes or the pathogenic organisms are carried by the lymphatic vessels or the blood. In the vast majority of cases, however, the disease begins as an endometritis and the tubes become secondarily involved by direct extension of the inflammation from the uterine cavity. Secondary infection from the peritoneum is comparatively infrequent, but cases are occasionally met in which a salpingitis has had its origin from an inflamed vermiform appendix or from a diseased area in some part of the intestinal tract to which the oviduct had become adherent and subsequently infected. Again, a tuberculous inflammation of the tubes may be secondary to tuberculosis of the peritoneum or it may be a part of a general infection, and in some cases it may be present as a primary lesion.

In the further consideration of the etiology of salpingitis we shall only discuss the uterine causes of the disease, as other sources of infection are very rare, and the special forms, such as tuberculosis of the tubes, are given elsewhere.

It is unnecessary to refer again to the causes of endometritis, as they are given in detail under its different varieties, but it will, however, render the subject clearer for us to bear in mind that inflammations of the endometrium are due to congestive, constitutional, gonorrheal, and septic causes, and that the sources of these pathologic conditions are many and various.

Varieties.—The disease occurs in two forms: (1) Catarrhal salpingitis and (2) purulent salpingitis.

Catarrhal Salpingitis.

Causes.—The disease is caused by the congestive and constitutional forms of endometritis and is not nearly so common as the purulent variety.

Pathology.—Catarrhal salpingitis usually runs a mild course and is not followed, as a rule, by grave pelvic lesions. The disease may be either *acute* or *chronic*.

Acute.—In this form the inflammation is confined to the mucous lining of the tube, but in some cases the muscular and peritoneal coats may be somewhat congested and slightly thickened. The mucous membrane is swollen, edematous, and inflamed, and the tubal secretion is greatly increased in amount. The disease may either run a rapid course or it may continue and pass eventually into the chronic stage. As a rule, mild cases terminate without causing any damage to the fimbriated extremities of the oviducts, and hence the abdominal and uterine openings of the tubes remain patulous. Sometimes the tubes become adherent to the adjacent structures during the acute stage of the disease, and these adhesions remain permanently after the inflammation has entirely subsided.

Chronic.—The inflammation, as in the acute variety, is chiefly limited to the mucous lining of the tube, but in some cases the muscular and peritoneal coats may be slightly involved and the oviduct increased somewhat in size. The mucous membrane is hypertrophied and congested and the tubal secretion is increased in amount. The abdominal and uterine openings of the tube may either remain patulous or become occluded. In the former case the secretions are drained into the uterine or pelvic cavities, and in the latter they are dammed up and the tube becomes distended, forming a cystic enlargement known as a *hydrosalpinx*. In rare instances the inflammation may be hemorrhagic in character and blood is mixed with the secretions, and if the tubal openings are occluded a *hematosalpinx* develops. The function of the oviducts is often interfered with by the destruction of their ciliated epithelium, which renders the patient sterile or exposes her to the danger of ectopic gestation. Adhesions between the tubes and adjacent structures are not uncommon, especially when the tubes are occluded and form cystic enlargements.

Symptoms.—The local lesions in cases of *acute catarrhal salpingitis* are so slight that the symptoms are nearly always obscured by those due to the coexisting endometritis, and hence the tubal disease often runs its course and terminates in recovery or passes into the chronic stage without the patient being aware of any additional trouble within the pelvis.

In the *chronic stages* the symptoms are even less marked than in the acute, and the presence of the disease is usually entirely overlooked unless hydrosalpinx or hematosalpinx develops, in which case there may be a feeling of weight and dragging in the pelvic cavity if the cystic tube is large enough to produce pressure.

The symptoms, therefore, of catarrhal salpingitis are the same as those caused by the congestive and constitutional forms of endometritis, which have already been given under the following headings: Leukorrhea; uterine hemorrhage; menstrual disturbances; pain; sterility; abortion; and the general symptoms (see p. 418). The effect upon these symptoms of an extension of the disease from the endometrium to the mucous lining of the oviducts is to slightly accentuate them, but not to change their character, and as the local and general manifestations of endometritis often vary in their severity and nature without the coexistence of catarrhal salpingitis, it naturally follows that there is nothing characteristic or even suspicious in this fact. In the early stages of severe acute attacks of catarrhal salpingitis the pulse and temperature are probably somewhat affected, and the patient may suffer from headache or backache; but these symptoms are, after all, so slight that they are hardly noticed, and there is no doubt of the fact that these cases are more common than is generally supposed.

Diagnosis.—It is impossible to make a positive diagnosis of acute catarrhal salpingitis, as the symptoms are indefinite and the local lesion produces no changes in the oviduct that can be detected by palpation, except in chronic cases, where hydrosalpinx or hematosalpinx develops. But even under these circumstances we can only infer from a general study of the symptoms that the original inflammation was catarrhal and not purulent in character, and hence our conclusions are of but little value, or at best they are extremely doubtful.

The diagnosis is based upon a consideration of the following subjects:

The history.
The symptoms.
The physical signs.

The History.—As catarrhal salpingitis is caused by the congestive or constitutional form of endometritis, the non-purulent nature of the tubal disease may be inferred if the history of the patient points to one of these varieties of uterine inflammation. This subject is fully discussed in the diagnosis of congestive and constitutional endometritis on pages 419 and 425.

The Symptoms.—As already stated, the symptoms are so indefinite that they are entirely obscured in most instances by those dependent upon the coexisting endometritis, and even in acute cases accompanied by a slight elevation of the temperature and an increase in the pulse-rate no definite opinion can be formed, as the physical examination yields negative results.

The Physical Signs.—In acute cases bimanual palpation does not reveal any change from the normal in the size or the consistency of the oviducts. There may be in some cases, however, a slight pain felt upon pressure over the tubes. The physical signs are entirely wanting in chronic cases except when a hydrosalpinx or a hematosalpinx is present.

Prognosis.—The majority of acute cases terminate in a spontaneous cure without doing any damage to the tube. Chronic cases, on the other hand, are slow and persistent in their course and liable to cause occlusion of the tubal openings or a destruction of the ciliated epithelium. Both of these pathologic conditions cause sterility, while the latter is one of the most frequent causes of ectopic gestation.

The cure of the coexisting endometritis is followed in many instances by the restoration of the tube to its normal condition, even in cases where the ciliated epithelium is involved; if, however, the tubal openings are occluded, no curative results will ensue.

Treatment.—In considering the treatment of catarrhal salpingitis we must bear in mind that it is inseparably connected with that of the congestive

and constitutional forms of endometritis, and that the lesions within the uterine cavity are the same as those within the oviducts. Furthermore, we must appreciate the fact that the relief of the tubal inflammation is entirely dependent upon the cure of the endometritis, and hence the treatment of catarrhal salpingitis begins and ends with that of the uterine disease. The first indication, therefore, in the treatment of salpingitis is to diagnose the variety of the coexisting endometritis (see pp. 419 and 425); second, to cure the uterine inflammation (see pp. 422 and 426); and, third, to relieve those conditions that are peculiar to the tubal affection, such as (*a*) the slight fever and pelvic pain which occur at times in the acute variety; (*b*) the hydrosalpinx or the hematosalpinx which may develop in the chronic form; and (*c*) the adhesions which may be present between the oviducts and the surrounding structures.

Fever and Pelvic Pain.—Should pelvic pain and fever occur during an acute attack, the patient must be kept absolutely at rest and the bed-pan employed when the bladder or bowels are evacuated. The vagina should be douched three times every twenty-four hours with two gallons of hot (110° to 120° F.) normal salt solution, hot compresses are placed over the lower abdomen (see p. 97), and the bowels are freely moved with a saline purgative. The diet should be liquid (see p. 106) for the first two or three days, and after that it should be soft in character (see p. 111) until the patient gets out of bed. The bowels are moved regularly once in every twenty-four hours with a saline, followed, if necessary, by a simple enema. Small doses of morphin should be given hypodermically if the patient is restless or suffers much pain.

The symptoms usually yield readily to treatment and the patient is generally out of bed in from ten days to two weeks.

Hydrosalpinx and Hematosalpinx.—The treatment of hydrosalpinx or hematosalpinx should be operative, and consists in the partial or complete removal of the distended tube. A positive diagnosis of the nature of such an enlargement is impossible prior to operation, and we are not justified in assuming that it will not endanger the patient's life at some future period.

Adhesions.—Adhesions are either not present in the vast majority of cases or they are too slight to cause symptoms. Occasionally, however, the oviducts may be firmly adherent to the surrounding organs and severe pelvic pain and distress result. Under these circumstances an abdominal section should be performed and the adhesions broken up, without, however, removing the oviducts unless they are found to be irreparably damaged.

Variation in Treatment.—After the coexisting endometritis has been cured it is often necessary to institute a plan of treatment to hasten the restoration of the tubes to their normal condition. This is accomplished by employing the local and general treatment recommended in subinvolution of the uterus (see p. 447).

Purulent Salpingitis.

Causes.—The disease is caused by the septic and gonorrheal varieties of endometritis. The inflammation of the uterine mucosa extends directly to the tubes and produces in them the same form of infection. Purulent salpingitis is a very common disease, and is, with very few exceptions, the cause of the various inflammatory lesions met in the pelvis. The vast majority of cases that are due to sepsis are puerperal in origin, and they even exceed in number those that are due to gonorrhea. In nearly all instances where the endometrium is the seat of a gonorrheal or septic infection the tubes become involved; on the

other hand, however, we undoubtedly meet cases in which the disease remains confined to the uterine cavity and the oviducts escape entirely.

Pathology.—Purulent salpingitis may be either *acute* or *chronic* in character. The septic variety, as a rule, begins acutely with frank, well-defined symptoms, but occasionally in mild cases the disease is subacute and follows a chronic course from the start. Gonorrheal salpingitis, on the other hand, is nearly always subacute or chronic from the beginning, and in the exceptional cases in which the affection begins acutely the inflammation is in all probability due to a mixed infection. Sometimes in acute cases only one tube is involved at first, but as the disease progresses the second oviduct is also infected and the inflammation becomes bilateral. So long as the endometrium remains diseased the second tube is always apt to become infected in time, but if the uterine inflammation is cured the infection may remain limited to one side. As a rule, therefore, salpingitis is bilateral in chronic cases.

Acute.—The inflammation begins in the mucous lining of the tube and almost immediately extends to the muscular and peritoneal coats. The disease is very rapid in its course, and in a few days the oviduct may become as large as the thumb, or it may be enormously distended with pus. The fimbriated extremity usually becomes occluded as the result of the inflammatory process and the purulent secretion escapes through the uterine opening of the tube, which, as a rule, remains patulous in the early stages of the disease. Sometimes, however, the abdominal opening is not sealed up at once and the pus may escape into the peritoneal cavity. The tube is often distorted or displaced, and, as a rule, it becomes soft and friable in consistency.

The inflammatory lesions may either undergo resolution and the tubes return to their normal state, or the inflammation may subside and leave them more or less permanently damaged. Again, the case may terminate fatally from peritonitis or general sepsis, and finally the disease may pass into the chronic form. There is no doubt that many of the milder cases of purulent salpingitis are entirely cured and the oviducts either restored to their normal condition or else damaged to a greater or lesser degree. In the vast majority of cases, however, except those which end fatally at once, the inflammation finally becomes chronic or subacute in character and structural changes occur in the tubes which destroy their function forever and either continually endanger the patient's life or make her a hopeless invalid.

Chronic.—In the chronic stage the lesions are more marked but less acute in character, and there is no tendency toward resolution. The fimbriated extremity of the tube is usually closed, but the uterine opening may remain patulous and the purulent secretions escape into the uterus. So long as the uterine opening remains pervious the secretion escapes and the tube does not become distended. Under these circumstances the disease is known as *chronic adherent* or *interstitial salpingitis*, and it represents the advanced stage of an acute attack. The oviduct is greatly increased in length and thickness; it is usually more or less tortuous; and its walls are either soft and friable or hard and nodular in consistency. In most cases the uterine end of the tube is only slightly infiltrated and hypertrophied, while the rest of the organ is greatly increased in size, giving it a club-shaped appearance. Sometimes, however, the entire tube is involved and the uterine end becomes so soft and brittle that it is readily cut through by a ligature. As the tube increases in size it gradually separates the layers of the mesosalpinx, and in many instances it comes into direct contact with

the ovary. The lumen of the tube is often constricted at one or more points, which gives a beaded appearance to the oviduct, and forms separate sacs in which pus accumulates. The entire tube may become atrophied in old chronic cases and nothing remain of the oviduct but a cord-like structure.

When both the abdominal and uterine openings of the tube are closed, the secretion is dammed up and cystic distention takes place. This distention is called a *pyosalpinx* when the tube contains pus; a *hydrosalpinx* when it contains serum, and a *hematosalpinx* when it contains blood. These cystic tumors of the oviducts will be considered in detail later on.

The closure of the uterine opening may be due to edema and hypertrophy of the mucous membrane; to ulcerative changes which may result either in adhesions between opposing surfaces or cicatricial contractions; or to the lumen of the tube being constricted by a sharp flexion or an external band of inflammatory exudate.

The fimbriated extremity of the tube becomes closed in salpingitis by two methods, according to Bland Sutton: *First*, the "inflammatory matters effused among and in the tissues of the fimbriæ cause them to swell, and adhere together, and often to the ovary. The effused material organizes and binds the agglutinated fimbriæ to adjacent structures, such as the ovary, broad ligaments, pelvic peritoneum, uterus, or rectum, and mechanically seals the ostium."

Fig. 470.

Fig. 480.

Fig. 481.

Salpingitic Closure of the Abdominal Opening of the Fallopian Tube. (Modified from Sutton.)

Fig. 479 shows the closure due to inflammatory exudate and adhesions between the fimbriæ and the ovary; Fig. 480 shows the closure due to lengthening of the muscular coat of the tube and partial inversion of the fimbriæ; Fig. 481 shows the complete inversion of the fimbriæ; note that the fimbriæ are exposed by cutting a section from the wall of the tube.

Second, "the Fallopian fimbriæ may be regarded as luxuriant protrusions of the mucous membrane, beyond the ostium. When inflamed, they enlarge greatly. As the inflammation extends into the muscular coat of the tube, it becomes lengthened, and gradually bulges over the fimbriæ, until the ostium presents a rounded orifice, instead of its usual fringed appearance. Eventually these rounded margins contract, narrow the orifice, and cohere, giving it a smooth, rounded end not unlike a sea-anemone with its tentacles retracted. On slitting up such a tube the fimbriæ will occasionally be found neatly folded up within it," or "a few of them may be nipped by the contracting ostium and be left projecting."

A cystic tumor of the oviduct is usually shaped like a pear, as the uterine portion of the tube is generally but slightly enlarged while the fimbriated end is greatly dilated. In other cases the whole tube is distended and the tumor assumes the shape of a sausage. The inferior portion of the tube is held down by the mesosalpinx, and as the oviduct becomes distended and elongated the superior portion dilates more rapidly and the tumor becomes shaped like a retort; in many cases the tube becomes tortuous and is folded more or less upon itself. A sacculated condition of the tube is not uncommon in cases of pyosalpinx, and in rare instances a serous, purulent, or bloody fluid may be found in separate pouches

in the same oviduct. It is not uncommon to find one tube filled with pus and the other with serum or blood.

Pyosalpinx.—When the Fallopian tube is distended with pus, the condition is called a pyosalpinx. The size of these cysts varies from a finger or a thumb to that of a fetal head, but, as a rule, they do not attain to very great proportions. In the beginning the pus is always septic and contains pathogenic germs. But later on the microorganisms may disappear entirely, and the pus is found to be sterile in over 50 per cent. of old cases of pyosalpinx. Sometimes a chronic pyosalpinx becomes converted into a hydrosalpinx by a clarification of the pus. Under these circumstances the solid constituents become deposited upon the walls of the cyst and a clear serum is substituted for the purulent material. Again, a hemorrhage may occur into an old pyosalpinx and fill it with blood (*hematosalpinx*). This is due to the rupture of a blood-vessel in the wall of the cyst, and may be caused either by direct violence or by torsion occurring in some portion of the tube. In recent cases the walls of the cyst are hypertrophied and much thicker than normal; but as the distention increases the tissues become thinned and a rupture may occur, followed by the escape of the tubal contents into the peritoneal cavity or into one of the hollow viscera. A pyosalpinx is usually firmly adherent to the surrounding structures, and it is sometimes difficult to enucleate the cyst without rupturing it. In other cases, however, the adhesions are soft and are easily separated without causing any injury to the walls of the tube. In most instances the cyst is adherent to the culdesac of Douglas and the posterior aspect of the lower portion of the broad ligament. When a pyosalpinx becomes adherent to the rectum, the character of the pus is altered and it has a foul fetid odor. In rare cases of pyosalpinx there may be an intermittent escape of pus into the uterus. This is due to the uterine end of the oviduct being sufficiently patulous to allow the tubal contents to escape whenever the tube becomes distended enough to overcome the obstruction. An old pyosalpinx that has remained dormant for a long time may become freshly infected and cause an acute attack of purulent salpingitis; the infection in these cases comes from the rectum, the intestine, the bladder, or the uterine cavity.

Hydrosalpinx.—When a tube is distended with serum the condition is called a hydrosalpinx. It may result from catarrhal salpingitis when both tubal openings are closed, or it may occur in an old pyosalpinx from the conversion of the pus into serum. The fluid varies in color and character. Usually it is composed of clear serum, but in some cases it may contain a little blood or pus. As a rule, it is free from germs, and if rupture or leakage occurs it is rapidly absorbed without causing any irritation of the peritoneum. The size of these cysts varies from a slight distention of the tube to that of a fetal head; but, as a rule, they do not grow larger than a small pear. The tubal walls are thin and transparent; the mucous membrane is atrophied and entirely destroyed; and if the cyst ruptures it may shrivel up and nothing remains of the tube but a fibrinous-like cord. Occasionally, as in pyosalpinx, the uterine opening of the oviduct may be slightly patulous and there may be an intermittent discharge of serum into the uterine cavity.

Hematosalpinx.—When the tube is distended with blood, the condition is called a hematosalpinx. This condition is very rare and only includes those cases in which a hemorrhage occurs into a cystic tube. Extrauterine pregnancy and an effusion of blood into an oviduct during menstruation are examples of spurious hematosalpinx, and should therefore not be considered here. A pyosalpinx or a hydrosalpinx may be converted into a hematosalpinx from a hemorrhage occurring into the cyst as the result of direct violence or of torsion oc-

curring in some portion of the tube. The blood in these cases may remain fluid, or it may coagulate and form an organized clot, or it may thicken and become tarry in consistency. The character of the walls of the cyst depends upon the nature of the tubal distention prior to the intracystic hemorrhage; it may, therefore, resemble a pyosalpinx or a hydrosalpinx, as the case may be. Should a hematosalpinx become freshly infected, it will become reconverted into a pyosalpinx, and symptoms of acute purulent salpingitis will rapidly intervene.

Extension of the Tubal Infection.—There are several ways by which the infection may escape from the tube to the adjacent structures:

1. The purulent secretion may escape through the abdominal opening of the tube.
2. The infection may be carried by the lymphatic channels through the walls of the tube.
3. The pathogenic organisms may penetrate the mesosalpinx and infect the cellular tissue of the broad ligament.
4. A pyosalpinx may rupture and its contents escape into the pelvic cavity.
5. Adhesions may form between the tube and the surrounding structures and later on the infection may pass through them to the adherent organ.

Through the Abdominal Opening of the Tube.—The abdominal opening of the tube generally becomes closed early in the course of an attack of purulent salpingitis, and, as a rule, only a small quantity of the tubal secretion escapes. The leakage usually occurs very gradually and is small in amount, and results in the formation of adhesions between the tube and the ovary and the subsequent closure of the abdominal opening before the infection has had time to extend to the peritoneal cavity. The process is therefore an effort upon the part of nature to seal up the infection and prevent the occurrence of general peritonitis. Sometimes, however, a large quantity of the purulent secretion escapes before the tubal opening is closed and a rapidly fatal peritonitis ensues.

Through the Lymphatic Channels.—An extension of the infection through the walls of the tube is a common occurrence, and, as a rule, it only results in the formation of adhesions. In some cases, however, it may cause a serious peritonitis, or a tubo-ovarian abscess may develop if the tube becomes adherent to the ovary. This method of extension is more common when the tubal openings are closed and the tube is distended with pus than when the uterine end of the oviduct is patulous and the secretion escapes into the uterus.

Through the Mesosalpinx.—The involvement of the connective tissue of the broad ligament by the infection passing through the mesosalpinx is a comparatively infrequent condition, and is more apt to occur in cases of pyosalpinx where the folds of the ligament are separated by the enlarged tube. This method of infection, however, may also occur in the non-cystic forms of the disease, and results in a cellulitis or a broad ligament abscess.

Through a Rupture.—One of the constant dangers in cases of pyosalpinx is the rupture of the tube and the escape of its contents into the peritoneal cavity. The rupture may be caused by some unusual form of exercise, such as lifting a heavy object, violent straining at stool, and brutal coitus. Sometimes it may result from a fall, a blow, or a kick, and it may also occur from a vaginal examination or an operation upon the cervix or the uterine cavity.

Through Adhesions.—In not a few cases the infection passes from the tube to an adjacent organ through adhesions which have formed between them, and the intestines, the ovary, the bladder, the rectum, the vermiform appendix, and other structures may become involved by this route.

Extra-tubal Results.—The results of chronic purulent salpingitis are studied under the following headings:

Adhesions.
Local and general peritonitis.
General sepsis.
Walled-off abscesses.
Cellulitis and abscesses of the broad ligament.
Tubo-ovarian abscesses and tubo-ovarian cysts.
Fistulous openings.
Appendicitis.

Adhesions.—The most frequent result of purulent salpingitis is the formation of adhesions which may vary in extent from a simple agglutination between the fimbriated extremity of the tube and the ovary to cases in which all the pelvic organs, the intestines, and the omentum are firmly matted together. *Recent* adhesions are soft and readily separated, while *old* adhesions are firm, tough, and organized. In the fibrinous variety of peritonitis the formation of lymph, as a rule, precedes the infection and limits its destructive action. The adhesions are usually firm and they glue the peritoneal surfaces quickly together. In time the lymph becomes organized, and the adherent structures cannot be separated without causing more or less laceration of the parts. The serous and suppurative forms of peritonitis, on the other hand, are attended with soft adhesions which are readily broken up, and which offer but little obstruction to the dissemination of the infection. In these cases the pelvic organs and intestines are covered with flakes of lymph, and in the serous variety the pelvic cavity contains several ounces of serosanguineous fluid.

In some cases the adhesions existing between coils of the intestine or between the gut and one of the pelvic organs may kink the bowel sufficiently to cause obstruction and jeopardize the patient's life. Sometimes the intestine may be constricted by a fibrous band drawn tightly across it, and the same condition results. In other cases the lumen of one of the ureters may be encroached upon and hydronephrosis may develop.

Local and General Peritonitis.—The local forms of peritonitis are more common than the general in chronic purulent salpingitis, for the reason that the abdominal end of the tube is sealed up and the infection must spread along one of the slower routes to reach the peritoneal cavity. Under these circumstances before the infection can become general it is walled off by the lymph that is thrown out, and the inflammation remains localized. Sometimes, however, a virulent and rapidly fatal general peritonitis may be caused by the rupture of a pyosalpinx or an abscess of the broad ligament and ovary. Again, an old tubal disease that has remained dormant for a long time may suddenly become active again from a fresh infection and cause a general peritonitis. Furthermore, the breaking-up of old pelvic adhesions by a rough vaginal examination or by pelvic massage may injure the walls of the intestine or the rectum sufficiently to allow the contents to escape into the abdominal cavity and cause a general infection. And, finally, a walled-off abscess or a small focus of pus may rupture at any time and produce a suppurative peritonitis.

General Sepsis.—The absorption of septic material by the system is not nearly so frequent as in the acute form, as the inflammation is not active and the diseased area is shut off by organized adhesions. Besides, old collections of pus are apt to be sterile and cannot cause systemic reaction. Sometimes, however, a fresh infection may occur in these cases and general sepsis may rapidly develop. In other cases a slow absorption goes on continually and the patient presents all the physical signs and symptoms of chronic infection.

Walled-off Abscesses.—When the infection extends from the tube and attacks the pelvic peritoneum, local suppuration may occur; and before the septic

inflammation has had time to spread to the general cavity, the pus is walled off by adhesions. In such cases either the entire pelvis may be filled with pus or small foci of purulent matter may be found scattered throughout a mass of adherent intestines. In the former case the sac of the abscess is formed by the adherent coils of intestine and the omentum, which completely enclose the pus and prevent the occurrence of general peritonitis.

Cellulitis and Abscesses of the Broad Ligament.—As stated above, the connective tissue of the broad ligament may become involved by the infection passing through the mesosalpinx after escaping from the tube. In these cases an active inflammation of the cellular tissue follows and eventually suppuration may result. Collections of pus between the folds of the broad ligament sometimes attain a large size and may cause a fatal ending by suddenly rupturing into the peritoneal cavity.

Tubo-ovarian Abscesses and Tubo-ovarian Cysts.—If the ovary becomes adherent to the tube and infection follows, the intervening tissues are destroyed and a permanent opening occurs between them which results in a tubo-ovarian abscess. The ovary is infected in these cases either directly through its outer coat or through a recently ruptured Graafian vesicle. The adventitious opening is usually situated at the point of adhesion, and may therefore be at the fimbriated extremity or in the side of the tube. As a rule, the abdominal opening of the oviduct becomes adherent to the ovary, but in some cases the adhesion may take place at its side, either from simple contact between the two organs or from the separation of the layers of the mesosalpinx by an enlarged tube. Tubo-ovarian abscesses may attain to a large size, and are usually so generally and firmly adherent to the surrounding structures that they are enucleated with the greatest difficulty.

If an ovarian cyst become adherent to the oviduct or to a hydrosalpinx and the intervening wall of separation becomes absorbed, a tubo-ovarian cyst results. These cysts are usually follicular in origin, although cases have been observed in which an adventitious opening was present between the tube and a large proliferous cyst. Cysts of follicular origin may be either unilateral or bilateral. They vary in size and are rarely larger than a man's fist. They usually contain a clear serum, which may, however, become brown in color from the presence of disorganized blood. In some cases the uterine end of the tube remains patulous and the fluid escapes into the uterus (*profluent ovarian hydrops*), thus preventing the distention of the sac and the growth of the tumor.

Fistulous Openings.—When a pyosalpinx adheres to one of the hollow viscera, there is always a chance that the wall of separation may become infected and eventually break down and form a fistulous communication between the tube and the bladder, the vagina, the intestines, the rectum, or the abdominal wall. These openings seldom heal spontaneously and usually continue to discharge for an indefinite period. Sometimes they become infected with tubercle bacilli, or the patient may gradually become exhausted from the long-continued suppurative drain upon her system. And, finally, the inflammation which results from the purulent discharge that flows into the bladder, the rectum, or other organs may cause most distressing symptoms and even endanger the patient's life.

Appendicitis.—Inflammation of the vermiform appendix sometimes occurs in purulent salpingitis from the organ adhering to the diseased oviducts. This cause of appendicitis is not a rare occurrence, and although the appendicular complication may not be recognized at the time, yet the comparative frequency with which the appendix is found adherent to an old pyosalpinx or to the uterus proves that the lesion is more common than is generally supposed.

Symptoms.—The disease may be either *acute* or *chronic.*

Acute.—The acute form of purulent salpingitis nearly always results from a septic infection of the endometrium following an abortion or a labor. The symptoms of the tubal disease cannot be separated from those dependent upon the acute septic endometritis and the local or general peritonitis which may accompany the affection. In other words, there are no symptoms which positively point to an extension of the infection to the tubes during an acute attack of septic puerperal endometritis. We may, of course, infer that such is the case from the gravity of the symptoms, from signs of peritonitis, from an increase of the pain in one or both iliac fossas, and from the physical examination, but, after all, our opinion is only a probable one, which is based upon inference alone, and therefore may not be correct. Consequently from a practical standpoint we must recognize the fact that the symptoms of acute purulent salpingitis are so obscured by those due to the puerperal septicemia that in describing the latter we say all there is to be said about the former. (See symptoms of acute septic endometritis, p. 432.)

Chronic.—The chronic form of the disease is either due to a gonorrheal infection which is nearly always subacute in character from the beginning, or to septic cases that have survived the acute stages. In addition to the symptoms that are caused by the tubal lesion, we must also take into consideration those which are dependent upon the chronic inflammation coexisting in the uterine cavity, and which are always associated with cases of chronic purulent salpingitis. These symptoms do not, as in the acute form of purulent salpingitis, obscure the manifestations of the tubal disease, because the uterine affection is chronic and does not cause any special local disturbance.

The symptoms of chronic gonorrheal and septic endometritis are given on pages 427 and 433.

The symptoms of chronic purulent salpingitis are considered under the following headings:

Pain.	Sterility.
Dysmenorrhea.	General symptoms.
Menorrhagia.	Recurrent acute attacks.
Amenorrhea.	Fresh infections.

Pain.—This is the most constant and the most significant symptom of interstitial salpingitis and of cystic distention of the oviducts. The pain is not due so much to the pathologic changes in the tube itself as to the extra-tubal conditions and complications. The mechanic pressure produced by a pyosalpinx or one of the other forms of cystic distention is accountable for most of the pain and discomfort experienced by these patients, and the displacement of the uterus and its appendages which usually accompanies the disease is also an important causative factor. Much of the distress in these cases is undoubtedly due to traction upon adhesions that have formed between the tube and the adjacent structures and which interfere more or less with the natural movements of the intestines, the rectum, and the pelvic organs. And, finally, pain may be caused by a local or general peritonitis which results from a slow leakage or a rupture of the tube.

The character and severity of the pain, as a rule, vary according to the cause; but they do not, however, always correspond to the serious nature of the lesion, and hence some patients may suffer only a slight amount of discomfort from a tubal cyst that is almost ready to rupture, while others, again, may have marked local symptoms from a non-cystic oviduct. The pain may be dull and heavy in character or it may be acute and agonizing, and in some cases the patient may

have only a sensation of weight and dragging in the pelvis. Occasionally women complain of a burning sensation in the region of the oviducts, and others, again, suffer from repeated attacks of pelvic colic. The pain in cases of chronic purulent salpingitis is usually constant, although it may be more or less modified by the position of the patient and by conditions that are dependent upon the functions of the pelvic organs or upon external causes. As a rule, the recumbent position relieves the acuteness of the symptom, and patients generally feel much more comfortable early in the morning than after they have been out of bed and on their feet for some time. The pain is increased by the erect posture; by walking or other forms of exercise; by the evacuation of the bladder and the bowels; by the pressure of the clothing about the waist; and by sexual intercourse. Constipation also increases the severity of the symptom, and women in whom the bowel movements are irregular suffer more than those who have a daily evacuation. The pelvic discomfort, pain, and soreness are aggravated at each menstrual period owing to the congestion and swelling that take place in the internal organs of generation. Usually as the disease becomes more and more chronic the pain gradually lessens in severity, and in some cases it may entirely disappear after the menopause.

The pain is situated in one or both iliac regions and it may extend to the lumbosacral region or radiate down the thighs. If the pelvic organs are generally adherent, the patient complains of tenderness over the lower abdomen and of soreness in the pelvis whenever she walks or takes any form of exercise.

Dysmenorrhea.—Painful menstruation is a more or less constant and characteristic symptom, and its severity does not seem to be influenced by the extent or seriousness of the tubal lesion. The pain begins about one week before the flow and does not cease until several days after it has stopped. It radiates from one or both of the iliac regions into the pelvic cavity and down the thighs.

Menorrhagia.—The disease is usually accompanied by a shortening of the intermenstrual periods and a lengthening of the duration of the flow, which may last in some cases from a week to ten days or even longer.

Amenorrhea.—In very exceptional cases the menstrual flow is scanty in amount and it may even be absent altogether.

Sterility.—Women suffering with chronic purulent salpingitis seldom conceive. The sterility in these cases is due to thickening of the external coat of the ovary, which prevents the rupture of the Graafian follicles and the subsequent escape of the ovules; to the closure of the fimbriated extremity of the tube; and to the loss of the ciliated epithelium, which prevents the ovum being carried through the oviduct into the uterus.

General Symptoms.—The health of the patient is always more or less affected by the local pain and general discomfort, as well as the slow absorption of septic matter which may accompany the disease. General debility, loss of weight, nervous exhaustion, and gastro-intestinal disturbances are common, and hence these patients frequently suffer with dyspepsia, want of appetite, and constipation.

Recurrent Acute Attacks.—It is not uncommon for acute attacks of local peritonitis to occur in the early stages of chronic purulent salpingitis, and they are by no means rare in old chronic cases. During the intervals between the attacks the patient may either enjoy comparatively good health and suffer but little local discomfort, or she may be a semi-invalid and incapacitated from attending to the duties of life. In old cases of pyosalpinx and interstitial salpingitis the adhesions are so firm and the closure of the fimbriated extremity of the tube so secure that there is but little danger of the purulent material escaping into the peritoneal cavity, but in the early stages of the disease the opposite conditions

exist, and the peritoneum is therefore more or less frequently the seat of a local inflammation that for the time being converts a chronic case into an acute one. These attacks may be indirectly caused by roughness in making a vaginal examination; by operations within the uterine cavity or upon the cervix; by sexual intercourse; by a blow or kick upon the abdomen; and by other forms of violence.

The attack is marked by an increase in the pelvic pain and tenderness. The temperature rises to 100° or 101° F. or higher; the pulse is rapid, but seldom goes beyond 100 or 110 unless the inflammation becomes general; and the lower abdomen is distended and tender to the touch. If general peritonitis develops, all of the symptoms are increased in severity, the entire abdomen becomes swollen, and the condition of the patient is profoundly septic.

Fresh Infections.—As stated above, over 50 per cent. of the cases of pyosalpinx contain sterile pus. But occasionally a fresh infection may occur, and all the symptoms of acute purulent salpingitis are developed in an old pus-tube that has remained dormant for a long time. The reinfection under these circumstances is sometimes very active and comes from the uterus or through an adhesion between the oviduct and one of the hollow viscera.

Diagnosis.—In discussing the diagnosis of purulent salpingitis we must draw a sharp line between the *acute* and *chronic* forms of the disease, because in the former the symptoms and the physical signs are so completely obscured by the coexisting endometritis that it is often impossible to decide the question of tubal involvement; in the latter instance, however, the opposite conditions exist, because the uterine disease is in a quiescent state, while the lesions of the oviducts cause certain characteristic symptoms and are more or less readily recognized by palpation. We must also bear in mind that while the gross lesions in the chronic form of the disease are, in a general way, easily determined by a bimanual examination, yet it is often difficult or impossible to know with any degree of exactness the precise nature of these lesions or to differentiate between them. For example, it is not within the range of our ability to distinguish between an interstitial salpingitis and a beginning pyosalpinx, because the tube in both cases is about equally enlarged. The differential diagnosis between a pyosalpinx, a hydrosalpinx, and a hematosalpinx is usually a matter of inference, and, finally, the extent of the pelvic adhesions or the presence of foci of pus in the pelvis can only be determined at the time of operation.

The diagnosis is based upon a consideration of the following subjects:

The history.	The physical signs.
The symptoms.	The microscopic examination.

The History.—The history of the patient is of the utmost practical importance in both the *acute* and *chronic* forms of the disease, as it enables us to trace the tubal affection back to a septic or gonorrheal infection and thus establish the diagnosis.

Acute Form.—The history of an infection in these cases is more readily obtained than in the chronic variety, because the patient is suffering with an acute disease the cause of which is fresh in her mind. These cases nearly always occur shortly after a labor or an abortion, and there is therefore no difficulty whatever in recognizing the cause. In exceptional cases the infection may be due to gonorrhea, and a careful investigation will usually elicit the fact that the woman had a suspicious intercourse shortly before she was taken ill, and although acute purulent salpingitis is rare under these circumstances, its possibility must always be borne in mind. When cases are met which do not give a history of either of the above means of infection, we must naturally question the patient and endeavor to

discover one of the other causes of septic endometritis. (See Causes of Septic Endometritis, p. 431.)

Chronic Form.—The age and social position of the patient are important. Pelvic inflammation occurring in young girls and in virgins is generally due to a dermoid cyst or to tuberculosis. In married women and prostitutes, on the other hand, gonorrhea and sepsis are the great causes.

When a tubal disease has been caused by a septic infection following a labor or a miscarriage, a careful investigation will nearly always reveal its origin even in those cases in which the infection was slight and had occurred many years before. In these cases the patient remembers that she was kept in bed longer than usual and that she suffered with more or less pain in the lower abdomen. She also recalls the fact that she had "chills and fever" for several days, and that when she got about again there was a constant pain in one or both iliac regions, which has continued up to the present time. Occasionally there is a history of recurrent acute attacks of pelvic inflammation which were associated with tenderness in the lower abdomen and fever, and which point to the presence of chronic purulent salpingitis. The history of a labor at term following an attack of puerperal sepsis is strong presumptive evidence that the disease had left no tubal damage, and that, consequently, a more recent cause must be found for the existing pelvic inflammation.

It is generally more or less difficult to trace the origin of a tubal inflammation to a gonorrheal infection, because, with the exception of prostitutes, there is always a natural inclination upon the part of a woman to deny having had illicit sexual intercourse, and because in many instances where wives have been infected by their husbands they are absolutely ignorant of the nature of the disease or the possibility of its occurrence. Besides, it is never advisable, for obvious reasons, to ask an unmarried woman if she has had sexual intercourse nor a wife if she suspects her husband of having infected her. As stated elsewhere, a gonorrheal infection is nearly always subacute or chronic from the beginning, and the symptoms are not sufficiently marked, as a rule, to attract the patient's attention until later on, when the gross tubal lesions are developed. This is directly contrary to the history of a septic case, which nearly always begins as an acute, frank attack, and presents a clear record of a cause. In the case of prostitutes or of women who do not hesitate to acknowledge their habits the history of a gonorrheal infection can usually be elicited by a careful investigation of the facts, but when the opposite conditions exist the interrogation of the patient must be conducted with tact so as not to arouse suspicion. It is not uncommon to meet cases of gonorrheal salpingitis in women who have been recently married. These women are usually sterile, or they may have had one child or an abortion, and the history of infection, which is generally very obscure, can only be obtained by a careful investigation of every trivial genito-urinary symptom that has occurred since marriage. These patients usually give a history of good health and normal pelvic organs prior to marriage, but shortly afterward they began to complain of slight smarting during urination, of more or less leukorrhea, and of some irritation of the vulva. These symptoms gradually disappeared and were soon forgotten, but later on pain and tenderness developed in one or both iliac regions and their general health began to suffer.

The Symptoms.—Acute Form.—The symptoms caused by the salpingitis cannot be separated from those that are due to acute septic inflammation of the endometrium, which obscure and overshadow them so completely that they are of but little value in determining whether or not the disease has extended from the uterus to the tubes.

Chronic Form.—Pain and dysmenorrhea are the chief symptoms that direct our attention to the presence of a chronic form of inflammatory trouble in the pelvis. Sterility is also an important symptom, as it points to the possible existence of a tubal lesion, and, finally, the run-down condition of the woman's health is significant of the chronic nature of the pelvic disease. The coexisting endometritis should also be taken into account, as it explains the origin of the suspected pelvic lesion and confirms the diagnostic value of the other symptoms.

The Physical Signs.—Acute Form.—The examination is made by *recto-abdominal* and *vagino-abdominal* palpation with the patient lying in the dorsal position either on the bed or upon a table.

In the vast majority of cases following labor at term the physical signs of tubal involvement cannot be determined with any degree of certainty or satisfaction owing to the large size of the uterus, the tender condition of the pelvis, and the small amount of hypertrophy that is present in the oviducts during the early stages of the disease. Under these circumstances all that can be elicited by palpation is a sensation of fullness on both sides of the uterus, and the diagnosis must therefore depend more upon the history and symptoms than upon any definite information derived from the physical signs. In very thin women, however, we may be able to recognize the tubes if they are sufficiently swollen, but these cases are the exception rather than the rule, and we must therefore generally be content to base the diagnosis upon inference and not upon facts. In septic cases following an abortion in the early months of pregnancy the local conditions are not the same, and we are, therefore, better able to determine the condition of the tubes by palpation. In these cases the uterus is only slightly enlarged, and consequently there is sufficient room in the pelvic cavity to map out the oviducts, which can often be done if they are enlarged and the woman is not too fat.

When pelvic peritonitis exists and the organs have become bound together by adhesions, the uterus is found to be immovable and the vault of the vagina feels hard and unyielding. The presence of cellulitis may be suspected when the base of the broad ligaments feels swollen and tense, and if suppuration has occurred a soft, doughy sensation is imparted to the examining finger, or fluctuation may be recognized if there is a large collection of pus.

The physical signs dependent upon the coexisting endometritis are given on page 434.

Chronic Form.—The examination is made by *recto-abdominal* and *vagino-abdominal* palpation with the patient lying in the dorsal position on a table. An anesthetic should be used in all cases in which the examination is unsatisfactory, otherwise a tubal lesion may be overlooked and errors made in the diagnosis. A slight enlargement of a tube is often very difficult or even impossible to recognize by touch, especially in women who are muscular or stout, and a cystic oviduct may be so completely surrounded by adherent structures that its physical characteristics cannot be determined by palpation.

The physical signs due to the following lesions are considered separately:

Chronic interstitial salpingitis.
Cystic enlargement of the oviducts.
Adhesions.
Walled-off abscesses.
Tubo-ovarian abscesses and cysts.
Fistulous openings.

Chronic Interstitial Salpingitis.—In some cases the tube is soft and so slightly enlarged that it cannot be recognized by palpation. In other instances it may be felt as a round, elongated, often irregular mass that is connected with one of the uterine horns by a hard, cord-like structure, which is the

infiltrated proximal end of the oviduct. This infiltrated condition of the tube may generally be detected by careful palpation, and as it is usually present in chronic interstitial salpingitis, it should be considered a very valuable sign of tubal disease. In some cases instead of the infiltration being uniform and regular in character it occurs in the form of one or more hard nodules situated in the tube near the uterus, between which and the pelvic mass no distinct connection can be traced. The diseased oviduct is usually displaced and adherent in the culdesac of Douglas; it may also be found beside the uterus, or immovably fixed by adhesions to the posterior aspect of the broad ligament; and in rare instances it may be situated in front of the womb. When the tube and ovary are bound together by adhesions, they form a tumor which is more or less round in shape and somewhat hard in consistency. As a rule, the size of the mass is greatly increased by the lymph which surrounds it and by the adhesions which it forms with adjacent organs, and under these circumstances a tubo-ovarian enlargement is often found to be much smaller when it is enucleated at the time of operation than when first outlined by palpation. If the ovary is not densely adherent to the tube, it may often be felt as a hard, ovoidal mass, somewhat enlarged, tender to the touch, and more or less immovable. In cases in which the pelvic organs are universally adherent the tube cannot be outlined, and we are therefore only able to detect an irregular, fixed mass which fills the pelvis and is connected with the uterus.

Cystic Enlargement of the Oviducts.—Deep palpation reveals a cystic mass situated in the pelvic cavity which can be traced to the uterine horn, and consequently recognized as a distended oviduct. The tumor frequently forms a tortuous, sausage-shaped mass, or it may have the outlines of a retort, and in some instances the ovary may be felt closely attached to it. As a rule, the mass is tender and painful when pressed upon by the examining finger, and if adhesions are present it is more or less immovable. As stated elsewhere, the greatest amount of distention is in the outer two-thirds of the tube, and hence a sulcus or depression can often be felt by the finger between it and the womb. The mobility of the uterus depends upon the presence or absence of adhesions; as a rule, however, the organ is more or less fixed in the pelvic cavity. The presence of fluctuation in the tubal mass depends upon the amount of fluid it contains, the thickness of the walls of the oviduct, and the extent of the surrounding adhesions. In a large sactosalpinx we are usually able to detect fluctuation, and even in cases of moderate distention it may readily be recognized if the walls of the tube are thin and the adhesions are not extensive. As a rule, a pyosalpinx and a hematosalpinx impart a doughy sensation to the examining finger, while the fluid in a hydrosalpinx can usually be detected if the tumor is of moderate size and not generally adherent. As in the case of interstitial salpingitis, a sactosalpinx may be found adherent to any part of the pelvic cavity. It is impossible to distinguish between the three varieties of tubal distention with any degree of certainty by the physical signs, and hence the diagnosis must be based upon the history and the symptoms of the patient.

Adhesions.—The presence or the absence of adhesions as well as their extent can be approximately determined by the latitude of motion in the uterus and its appendages. When all of the pelvic organs are found to be fixed and immovable, it is clearly evident that the adhesions are general; but when the uterus, the tubes, or the ovaries possess more or less mobility, it is very difficult to recognize the precise extent of the adventitious union. This is especially true when we endeavor to detect adhesions between the tube and the intestine, because the normal range of mobility possessed by the bowel is not likely to be

reached when the pelvic organs are pushed in various directions by the examining fingers. When the tube is adherent to the side of the uterus, the ovary, the posterior surface of the broad ligament, or to the culdesac of Douglas, deep palpation will usually reveal its position and the character or extent of the adhesions.

Walled-off Abscesses.—A physical examination will not reveal the presence of small foci of pus scattered throughout a mass of adherent intestines or in adhesions between adjacent organs. When, however, the pelvic cavity is the seat of a large abscess, the vaginal vault is greatly depressed or obliterated by the pressure of the purulent collection upon it, and fluctuation can usually be elicited by careful bimanual palpation. The uterus can seldom be outlined by the examining finger, as it is generally crowded out of position and surrounded by dense adhesions. The tubes and the ovaries cannot be palpated, as they are also buried in a matted mass of adherent organs which form a part of the wall that shuts off the abscess from the peritoneal cavity and limits the spread of the infection.

Tubo-ovarian Abscesses and Cysts.—A positive diagnosis is out of the question, as the physical signs do not differ from those elicited in cases of sactosalpinx. When, however, a tubo-ovarian abscess or cyst is small, it may occasionally be possible in very thin women to outline the ovoidal shape of the ovary and trace its connections with the distended tube; but if it has attained a large size, this cannot be done, as the organs are crowded together, and hence the lesion is not known or even suspected in the vast majority of instances until the patient is operated upon.

Fistulous Openings.—Bimanual palpation reveals the presence of a pelvic mass that is adjacent to and closely connected with the hollow viscus from which the purulent matter escapes.

If the discharge comes from the rectum, the patient is placed in the knee-chest position and a rectal speculum introduced. The opening into the bowel is then located by sight and the index-finger of the left hand inserted into the vagina. Pressure is now made upon the pelvic mass with the vaginal finger and the purulent matter escapes into the rectum if the fistulous opening is tubal in origin. When the discharge comes from the bladder, the patient is placed in the dorso-sacral elevated position and a cystoscope introduced. A careful inspection of the interior of the bladder will reveal the situation of the fistulous opening, and its connection with the tube may be determined by pressure in the same way as in cases in which the rupture has occurred into the rectum. If the discharge comes from the vagina, the patient is placed in the dorsal position and a vaginal speculum introduced. After locating the opening by sight deep pressure is made through the abdominal wall immediately above the symphysis pubis upon the pelvic mass, and if the fistulous tract communicates with it, pus is seen escaping into the vagina. The presence of a false passage between the tube and the intestine may be inferred when pus escapes from the anus and no fistulous opening can be discovered in the rectum.

The connection between a sinus in the abdominal wall and the tube is determined either by pressing upon the pelvic mass with the index-finger in the vagina and seeing the pus escape externally or by passing a long probe into the fistulous tract and feeling the tip of the instrument in the pelvic cavity.

The Microscopic Examination.—In those cases in which the history of the patient is indefinite and unsatisfactory the cause of the chronic tubal lesion may sometimes be determined and the diagnosis made by discovering gonococci in the secretions of the uterus, the vagina, the urethra, the glands of Skene, or the vulvo-vaginal glands.

Prognosis.—A gonococcus infection starts as a subacute or a chronic condition and is not, as a rule, immediately dangerous to life. A streptococcus infection, on the other hand, is acute or active from the beginning and is always perilous to life from the first. Both forms usually cause permanent damage to the tubes as well as pelvic adhesions, sterility, and chronic invalidism, and they also endanger the life of the patient from recurrent attacks of peritonitis, fresh infection, rupture of a tubal abscess, and exhaustion following a prolonged suppuration.

The complete restoration of the tube to its normal condition after an attack of purulent salpingitis is an exceedingly rare occurrence; but a symptomatic recovery may take place in some instances and the patient be restored to comparatively good health. The disease often delays the appearance of the menopause, but after it has occurred the symptoms may be relieved and the patient passes the remainder of her life with but little or no discomfort.

Treatment.—The treatment of purulent salpingitis is classified as follows:

1. Acute cases.
2. Chronic cases.
   (*a*) Without a gross lesion.
   (*b*) With a gross lesion.

Acute Cases.—The first indication is to actively treat the acute septic endometritis (see p. 436), leaving the tubal inflammation to take care of itself, as it is beyond the reach of local measures, and hence we must rely entirely upon removing the uterine source of the infection and trusting to nature to limit the spread of the disease by throwing out plastic lymph. One of three things happens in acute cases, either the tubal inflammation subsides and the oviduct is restored to its normal state, or the disease passes into the chronic form, or grave pelvic lesions develop and endanger the life of the woman.

The most frequent complications that occur during an acute attack are general peritonitis and collections of pus in the tubes or in the cellular tissues of the broad ligaments. The occurrence of general peritonitis is an indication for immediate radical operative measures, and the infected tube or tubes should be removed at once by the abdominal route (see *Salpingo-oöphorectomy*, p. 973) if the condition of the patient warrants it.

It is not only difficult but usually impossible to recognize the changes that are occurring in the tubes until the disease has developed sufficiently to cause a gross lesion. When, however, such a lesion is discovered and a diagnosis of acute pyosalpinx is made, the question of operative interference must be squarely met by the surgeon. These lesions do not become apparent, as a rule, until the disease has lasted several days, and the fact that the patient is still alive shows that the absorption of septic matter is slow and that nature has shut off more or less entirely the area of infection.

Under these circumstances operative measures should be delayed, as the patient is not in a favorable condition for operation and because her chances of ultimate recovery would be greater by waiting until convalescence has occurred before removing the uterine appendages. When a pyosalpinx is complicated by general peritonitis, abdominal section should be resorted to at once; but the inflammation of the peritoneum and not the tubal lesion is the indication for operation in these cases. Sometimes an acute pyosalpinx may attain a large size and the purulent collection may be felt through the vaginal vault. In these cases the pus should be evacuated through the vagina, and after the patient has recovered from the acute symptoms the uterine appendages should be removed by the abdominal route. If a broad ligament abscess develops, it should be opened

through the vagina, and later on a celiotomy should be performed and the diseased organs removed.

As a rule, abdominal section is contraindicated in cases of acute purulent salpingitis, except when general peritonitis develops, because these patients are usually profoundly septic and unable to stand operative interference. Pus collections in the pelvis, however, can be evacuated by the vagina without administering an anesthetic or causing shock, and this route should therefore always be selected during the acute stages of the disease. Later on, when the patient has recovered and is no longer septic, celiotomy should be performed and the infected organs removed.

Chronic Cases.—Without Gross Lesions.—The expectant plan of treatment may be tried in cases of chronic salpingitis in which no gross lesions exist, but unfortunately the results are seldom permanent, as pain and other symptoms usually recur when the treatment is stopped. This form of treatment is contraindicated in cases of sactosalpinx, and also where the uterus and its appendages are displaced and adherent.

The palliative treatment consists in first curing the coexisting endometritis (see pp. 430 and 438) and then relieving the tubal inflammation by employing the local and general measures recommended in subinvolution of the uterus (see p. 445). If the patient is not benefited after several months of treatment, abdominal section should be performed and such operative measures adopted as the existing pathologic conditions demand.

With Gross Lesions.—The following lesions are considered from the standpoint of treatment:

Adhesions.
Walled-off abscesses.
Abscesses of the broad ligaments.
Sactosalpinx.
Tubo-ovarian abscesses and cysts.
Fistulous openings.
Appendicitis.

Adhesions.—Abdominal section is indicated when the adhesions are sufficiently extensive to cause local pain or perversion of function, and the condition of the pelvic organs must determine the extent and nature of the surgical measures to be carried out in each case. If the uterus is retrodisplaced and adherent along with the uterine appendages, the adhesions should be broken up and the fundus attached to the abdominal wall. (See Ventral Suspension of the Uterus, p. 353.) The uterine appendages should always be carefully examined to determine the question of their removal, and if the abdominal openings of the oviducts are patulous the organs should not be removed, but when they are closed salpingo-oöphorectomy is generally indicated unless the patient is desirous of having children, in which case a conservative operation should be performed and the tube and ovary of one side saved. (See Conservative Operations, p. 572.)

Walled-off Abscesses.—A collection of pus in the pelvic cavity that is walled off by omental and intestinal adhesions must be evacuated and the sac drained. The vaginal route should be selected in these cases for the reason that when the operation is performed through an abdominal opening it is necessary to separate the adhesions, and hence the general peritoneal cavity is liable to become infected. By evacuating the pus through a vaginal incision, however, the adherent structures are not disturbed and the abscess cavity can be drained with but little or no risk to the patient. Later on, when the sac of the abscess has contracted, abdominal section should be performed and the diseased tubes removed.

Abscesses of the Broad Ligaments.—A broad ligament abscess should be

evacuated by a vaginal incision and an abdominal section performed at a later date to remove the diseased tubes.

Sactosalpinx.—Salpingo-oöphorectomy (*abdominal route*) is indicated in all cases of pyosalpinx, hematosalpinx, and hydrosalpinx.

Tubo-ovarian Abscesses and Cysts.—These cases require salpingo-oöphorectomy (*abdominal route*).

Fistulous Openings.—An abdominal section is indicated in these cases. The adherent and diseased tube is first removed and then the opening into the hollow viscus is closed if possible by sutures; but if this cannot be done, it is shut off from the general peritoneal cavity by glass drainage and gauze packing.

Appendicitis.—The abdominal cavity must be opened by a median incision and appendectomy followed by salpingo-oöphorectomy performed at once.

NEOPLASMS.

Tumors of the oviducts are comparatively rare, usually of small size, and of but little clinical interest.

The *subjective* and *objective symptoms* differ in no way from those caused by other pelvic growths, and a physical examination demonstrates only the presence of a tubal tumor without revealing its character.

These tumors should be removed by the abdominal route.

Fibromyoma.—Fibroid tumors of the oviducts are very rarely met. They develop in the muscular coat and are seldom large enough to cause local symptoms. In a case reported by Simpson, however, the tumor attained the size of a child's head.

Papilloma.—This is a rare form of tubal disease. The papillomatous mass may dilate the tube and protrude from its abdominal opening, or it may even rupture the oviduct and partially escape into the peritoneal cavity.

Lipoma.—Small fatty tumors of the oviducts have been described.

Cancer.—Cancer of the oviducts is usually secondary to cancer of the corporeal endometrium or the ovary. The disease seldom results from cancer of the cervix unless the body of the uterus is first involved. Primary cancer of the tubes is a very rare form of the disease.

Sarcoma.—The disease is exceedingly rare and is nearly always secondary to sarcoma of the body of the uterus or the ovary. The tumor does not, as a rule, reach a large size.

Gummata.—These tumors are occasionally found in women suffering with tertiary syphilis.

Cysts.—Small cysts that have no practical significance are frequently found in the oviducts. They generally have thin transparent walls and contain a clear serous fluid which is non-irritating to the peritoneum. These cysts may develop from the mucous, muscular, or serous coat of the tube. In the majority of cases, however, they are embryonic in origin and are developed from the remains of the Wolffian body or the duct of Müller. Sometimes a hemorrhage occurs in the walls of the tube and forms a blood-tumor which may eventually undergo changes and be converted into a serous cyst.

The most common variety of tubal cyst is the so-called *hydatid of Morgagni*, which originates from the upper end of the canal of Müller and is usually attached by a slender pedicle to the fimbriated end of the oviduct. These cysts vary in size from a pea to that of a walnut and contain a clear, non-irritating, serous fluid.

DISPLACEMENTS.

The oviducts may be displaced in any direction within the pelvic cavity or drawn upward into the abdomen by tumors, and they may also be found in the sac of an inguinal or crural hernia as well as in the cup-shaped depression formed by an inverted uterus.

CHAPTER XIX.

THE OVARIES.

MALFORMATIONS.

The following malformations have been observed:

Absence of the ovaries.
Rudimentary ovaries.
Supernumerary and accessory ovaries.
Displacements.

Absence of the Ovaries.—Absence of both ovaries is a very rare anomaly and is usually associated with a rudimentary condition or absence of other genital organs. Absence of one ovary, however, is more frequently met, and is said to be due to a constricting off of the *ovarian anlage* during the process of development, the separated organ consequently undergoing atrophy and complete obliteration. The condition is usually associated with defective development of the corresponding duct of Müller, and it is therefore not uncommon to find the anomaly associated with a unilateral vagina, a one-horned uterus, and an absent Fallopian tube.

Rudimentary Ovaries.—While an ill-developed or rudimentary condition of the ovaries is not a very frequent occurrence, it is, however, more commonly met than absence of these organs. The Graafian follicles and the ovules are generally defective in their development or absent altogether, and if both ovaries are involved menstruation is either scanty or amenorrhea is present and the patient is absolutely sterile. This variety of ovarian deformity is often associated with imperfect development of other genital organs, especially the tubes and the uterus, and in rare instances the large blood-vessels of the body and the nervous system are found to be defective.

Supernumerary and Accessory Ovaries.—A supernumerary ovary is an exceedingly rare occurrence and only one authentic case has been recorded (Winckel). The possibility of the existence of a third ovary, however, must be borne in mind in accounting for the continuance of menstruation or the occurrence of pregnancy after the removal of both ovaries. Accessory ovaries, on the other hand, are not uncommon, and are due to a constricting off of a part of the developing ovary, the separated portion retaining more or less of its identity.

Displacements.—Congenital displacements of the ovaries are more or less common, and the organs have been found occupying various abnormal positions in the pelvic and abdominal cavities, as well as forming a part of the contents of a hernial sac.

DISEASES OF THE OVARIES.

OVARITIS.

Synonyms.—Inflammation of the ovary; Oöphoritis.

Varieties.—The disease may be *acute* or *chronic*.

Acute Ovaritis.

Causes.—The disease is most frequently caused by purulent salpingitis (*septic* or *gonorrheal*), although in some cases the infection may be carried directly from the uterus to the ovaries by the lymphatic vessels before the tubes are involved. The disease is comparatively rare except in connection with puerperal sepsis, although cases are met from time to time which are due to other causes, and the affection has been observed in poisoning with arsenic or phosphorus; in the exanthemata; in cholera; in acute suppression of the menses; and in acute rheumatism. The ovary may be infected by the colon bacillus when it is adherent to the rectum or intestine and by the pneumococcus during an attack of pneumonia.

Pathology.—The ovary becomes swollen, edematous, and infiltrated with serum, and its surface is covered with lymph which forms adhesions with adjacent organs. If the inflammatory process continues, small foci of pus are scattered throughout the ovarian stroma, and eventually a large abscess is developed which completely destroys the organ. In the milder forms of the disease the inflammation may gradually subside and end in resolution before suppuration occurs. These cases, however, usually become chronic, and the ovary either remains permanently enlarged or the connective tissue undergoes retraction and cirrhosis results. The changes that occur in the ovary from thickening of its capsule and the hypertrophy or cirrhosis which is present are discussed under the Pathology of Chronic Ovaritis, and need not therefore be described here.

An ovarian abscess may increase in size and finally rupture, causing general peritonitis. As a rule, however, the lymph and adhesions which surround the ovary prevent this accident, and the condition passes into a chronic state, the pus either eventually becoming sterile or converted into a cheesy mass. An old abscess which has remained dormant for a long time may become suddenly active again from a fresh infection, as in the case of a pyosalpinx, and present all of the symptoms of the original attack.

When an acute ovaritis is due to gonorrheal infection, the lesions are chiefly limited to the surface of the ovary, and extensive adhesions are usually formed with adjacent structures.

Symptoms.—The symptoms of acute ovaritis must be studied in connection with the causes of the disease and also with reference to the character of the ovarian lesions.

When the infection starts in the uterus and the ovaries become secondarily involved, either through the tubes or by way of the lymphatic vessels, the symptoms of the ovaritis are so obscured by those due to the puerperal septicemia (*septic endometritis*) that in describing the latter we say all there is to be said about the former. (See Acute Septic Endometritis, p. 432.) In other words, the symptoms of the ovarian disease cannot be separated from those dependent upon the uterine inflammation and the local or general peritonitis which may accompany the affection.

In cases of acute ovaritis, however, in which the disease is not due to uterine infection the ovarian inflammation stands, as it were, alone, and is therefore not overshadowed by another lesion whose symptoms are predominant. Consequently when an acute ovaritis is caused by arsenic or phosphorus poisoning, the exanthemata, cholera, acute rheumatism, sudden suppression of the menses, or by the colon bacillus or the pneumococcus, the local symptoms are clearly defined and point with more or less certainty to the ovary as the seat of trouble. The patient complains of pain and tenderness in the iliac regions which are associated with elevated temperature and rapid pulse. The pain is sometimes

very acute; it is burning or lancinating in character and radiates to the thighs, the lumbosacral region, the bladder, the rectum, and occasionally to the breasts. In many cases there is more or less nausea and vomiting; the patient lies with her knees drawn up; and, as in orchitis, the parotid gland may become swollen.

Diagnosis.—The diagnosis is based upon a consideration of the following subjects:

The history.
The symptoms.
The physical signs.

The History.—These cases nearly always occur shortly after a labor or an abortion and are associated with acute septic endometritis. When the uterine infection is absent, a careful investigation will reveal one of the less common causes of the disease.

The Symptoms.—When the infection starts in the uterus, the symptoms are overshadowed by those dependent upon the coexisting septic endometritis, and consequently they are of but little, if any, practical value from the standpoint of diagnosis. In the less common forms of the affection the sudden development of ovarian pain and tenderness, associated with elevated temperature and rapid pulse, points to acute ovaritis.

The Physical Signs.—The examination is made by *recto-abdominal* and *vagino-abdominal* palpation with the patient lying in the dorsal position either on the bed or a table.

In acute ovaritis the ovary is found to be enlarged and tender on pressure. It may or may not be mobile, according to the absence or presence of adhesions; usually, however, the organ is found to be prolapsed and adherent. An ovarian abscess is round or globular in shape and fluctuation may be elicited if the patient is thin and the purulent collection is large.

In puerperal cases following labor at term the associated endometritis and peritonitis as well as the large size of the uterus render it difficult or impossible to palpate the ovary unless it is very much enlarged or the seat of an abscess. As a rule, however, the only physical signs that can be elicited by bimanual palpation are tenderness and fullness over the region of the ovaries; but as these symptoms are also present in salpingitis and in local peritonitis, the diagnosis cannot be based upon them. In septic cases following an abortion early in pregnancy a bimanual examination will often reveal the enlarged and tender ovary, which can be clearly outlined between the fingers if the woman is thin.

In non-puerperal cases the ovary may usually be palpated and the physical signs of ovaritis determined.

Differential Diagnosis.—The importance of distinguishing between acute non-puerperal ovaritis and appendicitis must be constantly borne in mind, as both affections come on suddenly and are characterized by pain, tenderness, elevated temperature, and rapid pulse. The history, the symptoms, and the physical signs of both diseases must be carefully studied, and if any doubt remains as to the nature of the case an exploratory incision must be performed at once, as it is better to be occasionally mistaken in the diagnosis than to run the risk of subjecting the patient to the dangers of an unrecognized attack of appendicitis.

Prognosis.—The non-puerperal forms of acute ovaritis are seldom dangerous to life and the acute symptoms usually subside in about one week. The ovary, however, usually remains enlarged or undergoes cirrhotic changes that destroy its function and render the woman sterile. In some of the cases of arrested development of the sexual organs met in young women the malformations have undoubtedly originated from an acute oöphoritis occurring in childhood which was caused by one of the exanthemata.

The puerperal forms of the disease are always dangerous to life, not only on account of the character of the ovarian inflammation, but also from the coexisting endometritis and general sepsis. If the ovarian inflammation subsides before suppuration occurs, resolution may take place, but even in these cases the ovary is usually irreparably damaged and the disease becomes chronic. In some cases an abscess develops in the ovary which may rupture into the general peritoneal cavity, causing a fatal peritonitis, or it may burst into one of the hollow viscera and form a permanent fistulous opening.

Treatment.—The treatment of acute ovaritis is classified as follows into:

Puerperal cases.

Non-puerperal cases.

Puerperal Cases.—The treatment is the same as in acute purulent salpingitis (see p. 501).

Non-puerperal Cases.—The patient must be kept absolutely at rest in the recumbent position and the bed-pan used when the bladder and the bowels are evacuated. The vagina is douched three times every twenty-four hours with two gallons of hot normal salt solution (110° to 120° F.) and an ice-bag (see p. 97) or hot compresses (see p. 97) are placed over the affected parts. The bowels should be well flushed at once with a saline purgative and then kept open daily with half a bottle of the citrate of magnesia, followed, if necessary, by a simple enema. The diet should be liquid (see p. 106) for the first two or three days, and after that it should be soft in character (see p. 111) until the patient gets out of bed. Small doses of morphin should be given if the patient is restless and she suffers much pain; these symptoms, however, rapidly disappear after the bowels are freely moved. The patient should be sponged regularly every day to keep her comfortable and also when the temperature reaches 103° F. The symptoms usually yield readily to treatment and the patient is generally out of bed in from ten days to two weeks.

If suppuration occurs in the ovary, abdominal section must be performed at once and the diseased organ removed.

Chronic Ovaritis.

Causes.—Chronic ovaritis is due to a large variety of causes. It is far more common than the acute form of the disease and is most frequently met during the child-bearing period of a woman's life. The affection often results from an incomplete resolution occurring in cases of acute inflammation of the ovary; it may also be caused by gonorrheal endometritis; in rare instances it may be septic in origin and subacute from the start; and it may also develop during an attack of syphilis. In a large proportion of the cases of chronic ovaritis the disease is congestive in origin, and develops very slowly as the result of pathologic conditions that interfere with the pelvic circulation. The most common of these causes are, displacements of the uterus and its appendages; masturbation; excessive sexual intercourse; unsatisfied sexual desire; the immoderate use of alcohol; pelvic tumors, especially uterine fibroids; and sterility or celibacy. Hyperemia of the ovaries is also commonly met in young girls at puberty who are kept closely applied to their studies and who are given but little time to devote to the development of their physique.

Pathology.—The disease is usually bilateral and the ovaries may or may not be adherent.

In some cases the ovary is very much increased in size and the seat of cystic degeneration. The cysts are caused by the hypertrophied ovarian capsule

preventing the rupture of the Graafian follicles, and hence a small cyst is formed each time one of them ripens. Thus, eventually the ovary becomes studded with small cysts which may finally coalesce and form one large sac filled with a clear watery fluid which may at times contain blood or have the consistency and appearance of the white of egg. A cystic ovary is generally free or only slightly adherent.

In other cases the ovary becomes the seat of chronic interstitial inflammation, which finally produces cirrhosis, and the organ becomes a small, hard, shriveled mass, firmly imbedded in dense adhesions.

Symptoms.—The ovarian disease may be associated with endometritis, salpingitis, pelvic tumors, and adhesions, and it is therefore important to bear in mind the symptoms of the coexisting lesions.

The symptoms of chronic ovaritis are considered under the following headings:

Pain.	Sterility.
Menstrual disturbances.	General symptoms.

Pain.—Pain is the most constant and the most significant symptom of chronic ovaritis. It is situated in one or both iliac regions and is usually most intense upon the left side. It may radiate to the lumbosacral region, the thighs, the bladder, or the rectum, and in some cases severe reflex pains may be felt in or under one or both breasts. The intensity of the pain is usually increased at the menstrual periods, and also when the uterus and the ovaries are displaced and adherent. If the menstrual flow is profuse, the pain is lessened in severity, but if it is scanty, the pain becomes more marked. The pain is intensified by the erect position, by walking or other forms of exercise, by defecation or urination, by the pressure of clothing about the waist, and by sexual intercourse. As a rule, the recumbent position relieves the acuteness of the symptom and patients generally feel much more comfortable early in the morning than after they have been out of bed and on their feet for some time.

Menstrual Disturbances.—Menorrhagia and metrorrhagia are frequently associated with large cystic ovaries; in cirrhotic cases, on the other hand, the opposite conditions exist and amenorrhea is likely to result.

Sterility.—Women suffering with chronic ovaritis seldom conceive, as the ovaries are either entirely destroyed or the thickened capsule prevents the ova from escaping.

General Symptoms.—General debility, loss of weight, nervous exhaustion, and gastro-intestinal disturbances are common, and hence these women frequently suffer from dyspepsia, want of appetite, constipation, mental depression, hysteria, hystero-epilepsy, and migraine.

Diagnosis.—The diagnosis is based upon a consideration of the following subjects:

The history.
The symptoms.
The physical signs.

The History.—The patient should be carefully interrogated to discover, if possible, a cause for the disease. The history may reveal the fact that the woman had had an acute ovaritis many years before or she had suffered from acute rheumatism. Again, the patient may be syphilitic or she may have had a gonorrheal or septic infection. The congestive causes of the disease should be thoroughly studied, especially those which are due to irregularities in the sexual life of the patient. And, finally, we must not lose sight of the possibility of the exanthemata of childhood being responsible at times for chronic inflammatory changes in the ovaries occurring in women after puberty.

The Symptoms.—The situation, character, and constancy of the local pain direct our attention to the presence of a pelvic lesion. The reflex pains in the breasts, the sterility, and the acute suffering before each menstrual period suggest the possibility of chronic ovarian inflammation.

The Physical Signs.—The examination is made by *recto-abdominal* and *vagino-abdominal* palpation with the patient lying in the dorsal position on a table.

An enlarged or cystic ovary may usually be recognized by palpation. The organ is oval or globular in shape, tender to the touch, and situated either on one side of the uterus or in the culdesac of Douglas.

A cirrhotic ovary, on the other hand, cannot be felt by the examining finger, as it is atrophied and usually buried in a mass consisting of the tube and coils of intestine matted together by adhesions.

Prognosis.—Chronic ovaritis rarely causes death unless suppuration occurs and is followed by peritonitis. The disease, however, is seldom cured spontaneously, and treatment, as a rule, only results in temporary relief. The symptoms show no tendency to lessen in severity until after the menopause, when they gradually become less marked or disappear entirely. Sterility is common.

Treatment.—The treatment of chronic ovaritis is classified as follows:

The palliative treatment.

The radical treatment.

The Palliative Treatment.—This form of treatment may be tried in women who have independent means and are willing to submit to the necessary inconveniences. Unfortunately, however, the results are seldom permanent, as the pain and other symptoms usually recur when the treatment is stopped. The best results are obtained, however, in women who are approaching the menopause, as they may often be kept comparatively comfortable until menstruation ceases and nature relieves the pathologic conditions. Women who are dependent for a living upon their own efforts should not employ the palliative treatment, as the results are too uncertain to compensate them for the loss of time and money.

The palliative treatment is not applicable to every case of chronic ovaritis and a careful study of the pelvis must be made before deciding to adopt it. The treatment may be tried, provided the ovaritis is not complicated with salpingitis, and also when the ovaries are but slightly enlarged, free from adhesions, and not prolapsed. It is contraindicated, on the other hand, when the hypertrophy is marked, or the organs are displaced and immovable. The same is true when the ovaries are cirrhotic, as no form of local or general treatment can restore the diseased and altered condition of the structures of the organs.

The palliative treatment may be discussed under the following headings:

The removal of the cause.

The local and general treatment.

The Removal of the Cause.—It is impossible to derive any benefit from treatment without first removing the cause of the ovarian inflammation, and if this cannot be done palliative measures should not be instituted. When, therefore, the affection is due to such conditions as salpingitis, pelvic tumors, uterine adhesions, sterility, or celibacy, it is useless to try local and general methods of treatment. On the other hand, there are many causative lesions that can readily be removed, as, for example, endometritis, laceration of the cervix or perineum, and a recently displaced uterus without adhesions. In these cases the endometritis should be cured by curetment, the laceration should be repaired, and the uterus should be held in position by a pessary. A careful consideration should be given to the habits of the patient, and those which have been the cause of the disease or are likely to aggravate it must be corrected. The immoderate

use of alcohol and the habit of masturbation or excessive coitus must be forbidden, or if the affection arises from unsatisfied sexual desires, the mind of the woman must be directed toward more healthful subjects and conditions.

The Local and General Treatment.—Rest is an important adjunct in the treatment, and whenever it can be carried out the woman should be put to bed for the first six or eight weeks. During the menstrual periods the patient must be kept absolutely quiet in the recumbent position and the bed-pan used when required. Good results are also derived from taking a short nap every afternoon and retiring early for the night. Coitus must be forbidden and the husband and the wife should occupy separate beds to avoid the possibility of sexual excitement.

The vagina should be douched every night and morning with a gallon or more of hot normal salt solution, and before going to bed the patient should insert into the vagina a cotton-wool tampon saturated with glycerin, and remove it on the following morning.

The entire cervix and vaginal vault should be painted twice a week with tincture of iodin and a tampon of ichthyol and glycerin (25 per cent.) introduced into the vagina and allowed to remain until the following morning.

The diet should be nourishing and easily digested; plenty of pure water should be drunk; and the bowels should be opened daily, as any tendency to constipation increases the pelvic congestion and adds to the local trouble. The daily use of a mild laxative and the administration twice a week of a saline are usually all that will be needed in the way of purgation. Good results often follow the use of citrate of magnesia, Hunyadi Janos, and the saline mineral spring waters, especially those containing sodium chlorid. General massage is indicated in these cases, and should be given every day or at least three times a week.

The administration of internal remedies is important in the treatment of chronic ovaritis. As a routine procedure I place these patients upon the iodid of potassium and the bichlorid of mercury (gr. $\frac{1}{100}$). I begin with five minims of a saturated solution of the iodid of potassium three times daily immediately after eating, and every day increase each dose one minim until fifteen or twenty minims are taken; the remedy is then continued indefinitely. The chlorid of gold and sodium (gr. $\frac{1}{50}$ to $\frac{1}{10}$) may be substituted for the mercuric chlorid, as it seems to have a beneficial effect upon the ovarian inflammation and a tendency to reduce the size of the organ.

If the patient is restless and nervous, bromid of sodium should be given two or three times daily in doses of ten to thirty grains. Cannabis indica in the form of the tincture (♏x to xx) is also of value in these cases, as it relieves the ovarian pain and quiets the nervous system; it may be taken alone or in combination with bromid of sodium.

The following bitter tonics are often indicated and employed with advantage: Tincture of nux vomica; compound tincture of cinchona; strychnin; and quinin.

The severe ovarian pains that are felt for a few days before menstruation are usually relieved by administering tincture of cannabis indica, antipyrin, tincture of pulsatilla, or the bromids. A hot-water bag applied to the lower abdomen is also of service in these cases.

Exercise in the open air and sunshine is very beneficial in cases of chronic ovaritis. Indoor exercises are also employed to strengthen the pelvic organs and the muscles of the abdomen, as well as to stimulate the circulation of the pelvis (see p. 117), and a properly made abdominal binder (see p. 650) should be worn when the belly is relaxed. The clothing should be supported from the shoulders

and not from the waist, as constriction around the lower abdomen exerts an injurious pressure and increases the congestion of the pelvic organs.

Hydrotherapy.—The following sedative baths give good results: The full hot bath (p. 83); the Turkish or Russian bath (p. 89); and the hot sitz-bath (p. 87).

The Radical Treatment.—Chronic ovaritis, as a rule, eventually demands some form of surgical interference, not only on account of the associated pelvic lesions, but also because there is seldom any permanent benefit derived from the palliative treatment. The abdominal route should always be selected and such operative measures adopted as the existing pathologic conditions require.

Salpingo-oöphorectomy is indicated in cases in which the ovary is cirrhotic or the tube is irreparably damaged. When the ovary is enlarged or cystic and the oviduct is patulous, the question of a conservative operation (see p. 572) must be considered if the patient is desirous of having children. When the uterus is retrodisplaced and adherent along with the appendages, the adhesions should be broken up and the fundus attached to the abdominal wall (see Ventral Suspension of the Uterus, p. 353); the condition of the tubes and ovaries deciding whether salpingo-oöphorectomy or some form of conservative operation should be performed.

PROLAPSE.

Causes.—The causes of prolapse of the ovary are due either to *secondary* or *primary* conditions.

The displacement is *secondary* when the organ is pulled downward by a retrodisplaced uterus or a diseased tube. It may also occur from the contraction of adhesions that have formed upon the ovary during an attack of peritonitis, or the organ may be dislocated by the pressure of a pelvic tumor. These varieties of prolapse will not be considered here, as they are simply complications occurring with other and graver lesions.

A *primary* prolapse is one in which the displacement of the ovary occurs independently of other pelvic lesions and without any accompanying dislocation of the uterus or the oviduct. The chief cause of primary prolapse is an increase in the weight of the ovary, and we find that subinvolution is one of the most frequent causative factors. The ovaries, as well as the other pelvic organs and ligaments, become hypertrophied during pregnancy, and if involution is interfered with after labor prolapse is likely to occur, as they are abnormally heavy and their supporting ligaments are elongated and relaxed. A chronic ovaritis resulting in an enlarged or cystic ovary is often the cause of prolapse, and cases are occasionally met in which the increased weight of the organ is due to a small tumor. An acute prolapse may be caused by an injury or a sudden strain, but it is very doubtful whether the displacement becomes permanent unless the ovary is enlarged and heavier than normal. Prolapse of the ovaries is sometimes found in patients who are suffering from a chronic disease that is accompanied by loss of weight and general debility. The displacement in these cases is due to the lack of pelvic fat and the relaxed state of the uterine and ovarian ligaments.

The left ovary is more frequently displaced than the right. The reasons for this difference are, *first*, the left ovarian vein has no valve and opens into the renal at a right angle, and hence the ovary is predisposed to passive congestion; *second*, the rectum lies to the left of the median line, and consequently the ovary on that side is affected first by the mechanic interference that occurs in cases of chronic constipation; and, *third*, the left ovary becomes more hypertrophied during pregnancy than the right, and it is therefore heavier and more readily displaced if involution is arrested after labor.

Symptoms.—The symptoms due to prolapse of the ovary are often combined with those caused by chronic ovaritis or by subinvolution of the uterus.

Pain is the chief symptom of prolapse, which is usually absent while the patient is in the recumbent position; but when she stands erect or assumes the sitting posture, there is always more or less suffering. The pain is increased during coitus, urination, and defecation, and is also aggravated by walking or by any form of exercise, as well as by tight lacing or constrictions around the waist. The prolapsed ovary is sometimes so tender that coitus is impossible, and the pain following defecation often continues for an hour or more. The pain is situated in the iliac region or deep down in the pelvis near the sacrum, and it may radiate to the hips, the lumbosacral region, the rectum, or down the thighs. A reflex pain is frequently felt in the breast that corresponds with the prolapsed ovary. The pain varies in character from a dull, heavy ache to a sharp, agonizing sensation which is often accompanied by faintness and nausea.

Menstruation is apt to be more or less affected. The flow is, as a rule, increased in amount; dysmenorrhea is often present; and the monthly congestion causes the prolapsed ovary to become more swollen and tender.

Nausea and *vomiting* are common symptoms. The patient may also suffer from gastro-intestinal indigestion, hysteria, and headache. *Neurasthenia* is not a rare condition, and it is often accompanied by mental depression, physical exhaustion, and great irritability of temperament.

Diagnosis.—The examination is made by *recto-abdominal* and *vagino-abdominal* palpation with the patient lying on a table in the dorsal posture.

The diagnosis is based upon finding the ovary in a prolapsed position.

The displaced organ is recognized by its shape and connection with the horn of the uterus. It may or may not be movable, and pressure upon it causes pain and a peculiar nauseating sensation. In some cases the ovary may be only slightly displaced; in others it may be completely prolapsed and found lying behind the cervix in the culdesac of Douglas.

Differential Diagnosis.—The affection must be distinguished at times from a retrodisplaced uterus or a small pedunculated uterine fibroid.

A prolapsed ovary lying behind the cervix in the culdesac of Douglas may be mistaken for the fundus of the uterus. Under these circumstances the fundus will be found in its normal position, while the post-uterine enlargement will be tender upon pressure and freely movable unless adhesions are present.

A small pedunculated fibroid is not sensitive and is harder in consistency than the ovary.

Prognosis.—The prognosis depends upon the cause of the displacement. When the affection is due to chronic ovaritis or to a small ovarian tumor, little or nothing can be done by local and general medication; but when it is caused by subinvolution or by a debilitating disease, the outlook is more encouraging, and the ovary may occasionally be permanently restored to its normal position.

Treatment.—The treatment of prolapse of the ovary is divided into:

The palliative treatment.

The radical treatment.

The Palliative Treatment.—This form of treatment should be tried when the prolapse is caused by subinvolution or by debilitating diseases; it is, however, contraindicated if the ovary is diseased, greatly enlarged, or adherent.

Rest is an important adjunct in the treatment, and during the menstrual periods the patient must be kept absolutely at rest and the bed-pan used when required. Beneficial results are also derived from taking a short nap every afternoon and retiring early for the night. Coitus must be absolutely prohibited and the husband and wife should occupy separate beds.

The vagina should be douched twice a day with a gallon or more of hot normal salt solution, and before going to bed the patient should insert a vaginal tampon saturated with glycerin and remove it on the following morning.

The cervix and vaginal vault should be painted twice a week with tincture of iodin and a tampon of ichthyol and glycerin (25 per cent.) introduced into the vagina and allowed to remain until the following morning.

The patient should assume the knee-chest position for ten or fifteen minutes every morning, noon, and night. In this position all the pelvic organs fall forward toward the diaphragm, carrying the ovary out of the pelvis and temporarily relieving the congestion. The patient should also sleep at night upon her side or abdomen, so as to relieve the pressure upon the prolapsed ovary and to lessen the pain.

The use of pessaries to support a prolapsed ovary cannot be recommended, as they do no good and often aggravate the trouble by exerting pressure upon the organ. A pledget of cotton-wool placed in the posterior vaginal culdesac is, upon first thought, an ideal method of supporting a prolapsed ovary and relieving the pain; but unfortunately the tampon becomes displaced almost immediately, and it is therefore of but little, if any, use.

The diet should be nourishing and easily digested; plenty of pure water should be drunk and the bowels should be opened daily. In addition to the daily use of a mild laxative, good results often follow the administration of citrate of magnesia, Hunyadi Janos, or saline mineral spring waters, especially those containing chlorid of sodium. General massage is indicated and should be given every day or at least three times a week.

Indoor exercises should be employed to strengthen the pelvic organs and the muscles of the abdomen, as well as to stimulate the circulation of the pelvis (see p. 117). Plenty of exercise in the open air and sunshine is indicated and should be insisted upon by the attending physician. If the abdominal walls are relaxed, a properly made binder should be worn and the clothing should be supported from the shoulders so as to relieve the constriction about the waist.

Hydrotherapy.—The following tonic baths give good results: The cold full bath (p. 83); the cold sponge bath (p. 84); the Scotch douche (p. 87), and the cold sitz-bath (p. 87).

The Radical Treatment.—This form of treatment, which is essentially surgical, is indicated when palliative measures fail to restore the ovary to its normal position or relieve the symptoms, and should also be recommended when the organ is diseased, greatly enlarged, or adherent.

The abdominal route should always be selected and such operative measures adopted as the existing pathologic conditions require.

Salpingo-oöphorectomy is indicated when the ovary is diseased, greatly enlarged, or the seat of a tumor. If no gross lesion of the ovary is present, the organ should not be sacrificed, as the displacement can be permanently corrected by suturing the infundibulopelvic ligament above the brim of the pelvis (see p. 580).

A conservative operation upon the ovary should always be considered even when it is more or less diseased, and resection followed by suspension of the infundibulopelvic ligament practised if the patient is anxious to have children and willing to run the risk of the necessity for a secondary abdominal section.

HERNIA.

Description.—Hernia of the ovary is a comparatively rare condition. It may be *acquired* or *congenital;* the latter form, however, is so seldom met that most authorities question the possibility of its occurrence. In some instances the her-

nial sac may only contain the ovary, but, as a rule, the oviduct and the omentum or the intestine also accompany it. In these cases the ovary becomes adherent to the omentum or intestine and is pulled into the hernial sac. The displaced ovary may become inflamed and undergo cystic degeneration or it may become adherent to the sac. Suppuration has also occurred and in rare instances the organ has become cancerous. Unless the organ is diseased ovulation continues, and cases are on record where conception has taken place.

Varieties.—The ovary has been found in an inguinal, a femoral, an obturator, a ventral, and an umbilical hernia; it has also passed through the greater sacrosciatic foramen.

Symptoms.—In some cases no symptoms are present except those caused by the hernia itself. Generally, however, the hernial mass becomes swollen and tender during menstruation and the patient complains of severe pain. If the ovary becomes inflamed or cystic, pain and tenderness are constant symptoms, and when suppuration occurs the signs of a localized abscess are rapidly developed.

Diagnosis.—The diagnosis is based upon the presence of a hernial sac which contains a hard mass corresponding in shape and size to that of an ovary; the nauseating sensation felt upon pressure; the proximity of the uterus to the hernial canal; the absence of the ovary on that side; the traction that is felt upon the hernia when the uterus is pressed upon by the examining finger; and the swelling and tenderness that occur during menstruation.

Treatment.—The treatment is divided into: (1) the palliative and (2) the radical.

The Palliative Treatment.—This form of treatment, which consists in reducing the hernia by taxis and applying a truss, is contraindicated if the ovary is diseased or adherent.

The Radical Treatment.—Herniotomy is indicated when the ovary is diseased or adherent, and also when the patient prefers a radical cure to wearing a truss. The ovary should never be extirpated unless it is sufficiently diseased to destroy its function.

HEMORRHAGE.

Causes.—Hemorrhage of the ovaries may be caused by any condition that interferes with the venous circulation of the pelvis. Thus, it may depend upon sexual excesses, coitus during menstruation, onanism, masturbation, pelvic and abdominal tumors, adhesions, uterine displacements, diseases of the heart, lungs, liver, and kidneys, and upon sedentary habits. A predisposing cause is also found in the hyperemia of the ovaries that is commonly met at puberty in young girls who are kept closely applied to their studies and who are given but little time to devote to the development of their physique. Again, an ovarian hemorrhage may occur during the course of an acute fever, or it may be due to phosphorus poisoning, anemia, scurvy, and puerperal sepsis; and, finally, it may result from an extensive burn or from traumatism.

Pathology.—The hemorrhage may occur either into the Graafian follicles or into the stroma of the ovary; the former is known as *follicular hemorrhage* and the latter as *ovarian apoplexy*.

The *follicular variety* is the most frequent form of the affection, and the ovary itself is only slightly enlarged, but the follicle becomes distended from the size of a pin's head to that of an orange. In some cases only one follicle is involved; but when the hemorrhage occurs into several vesicles, the surface of the ovary is studded with small, dark, rounded elevations which either remain separated or coalesce and form a simple large blood-cyst. As a rule, the extravasated

blood is absorbed and the ovary restored to its normal condition. If, however, absorption does not take place, the blood either becomes tarry in consistency and chocolate in color or the solid constituents are separated from the fluid portion and a serous cyst remains. Sometimes suppuration occurs in the sac and an ovarian abscess is formed, or the hematoma may rupture into the peritoneal cavity and either form an intraperitoneal hematocele or cause a general peritonitis.

An *ovarian apoplexy* may vary in amount from microscopic extravasations of blood scattered throughout the stroma of the ovary to that of a hematoma the size of an orange or even larger. As a rule, however, small hemorrhagic spots are seen with the naked eye on the cut surface of the organ, and in exceptional cases the entire stroma may be infiltrated with blood. An ovarian apoplexy may be secondary to a follicular hemorrhage, and it may also occur as a primary condition. It may terminate by absorption; undergo the same changes as in the case of follicular hemorrhages; or if the apoplexy is very large, the ovary may rupture and the blood escape either between the layers of the broad ligament or into the abdominal cavity.

Symptoms.—The symptoms depend upon the extent and results of the hemorrhage, and small extravasations may occur without giving rise to any local manifestations. A hemorrhage large enough to cause distention will be accompanied with more or less pain in the ovarian region, and if rupture occurs and the bleeding is excessive symptoms of shock may develop. If suppuration takes place in an ovarian hematoma, the local and general symptoms of a pelvic abscess are present.

Diagnosis.—The diagnosis of ovarian hemorrhage is seldom made at the bedside, as the symptoms are not characteristic and merely point to the pelvis as the seat of trouble. The physical examination is likewise unsatisfactory, and only reveals an ovarian tumor without giving any indication of its nature. The sudden development of symptoms pointing to internal hemorrhage does not indicate that the ovary has ruptured, as this condition is more frequently the result of other lesions. If, however, no ovarian tumor can be felt in a patient who was known to have had a large ovary, we would be justified in presuming that the hemorrhage was due to rupture of the organ.

Treatment.—A small follicular hemorrhage and slight extravasations of blood into the stroma of the ovary are never recognized at the bedside. The same is true when the ovary is distended with blood, as the physical examination simply reveals the presence of an ovarian tumor. As the treatment in all cases of ovarian tumor is extirpation, the question of the nature of the lesion is of no practical importance. The development of symptoms pointing to an internal hemorrhage requires that an abdominal section should be performed at once and the ruptured ovary removed along with its tube.

HYDROCELE.

Ovarian hydroceles, according to Bland Sutton, "arise in a tunic of peritoneum that occasionally invests the ovary much in the same way that the tunica vaginalis clothes the testis."

Sutton summarizes the characteristics of these cysts as follows: (1) The Fallopian tube opens by its abdominal ostium into a sac on the posterior aspect of the broad ligament. (2) The tube is elongated, dilated, and tortuous, and as Griffith aptly expresses it, the general outline of the parts resembles a retort with a convoluted delivery tube. (3) As a rule, there is no evidence of inflammation. The cyst may suppurate should the tube become affected with salpingitis. (4) In small cysts the ovary will be found projecting on the floor of the sac. In

larger specimens it will be incorporated with the wall of the sac, and in very large specimens it is unrecognizable.

An ovarian hydrocele varies in size from a very small cyst to that of a child's head. The sac contains a clear, straw-colored fluid, which may, however, become purulent in character if the Fallopian tube becomes infected. In very rare instances an ovarian hydrocele may be intermitting in character and discharge its fluid contents through the tube into the uterus.

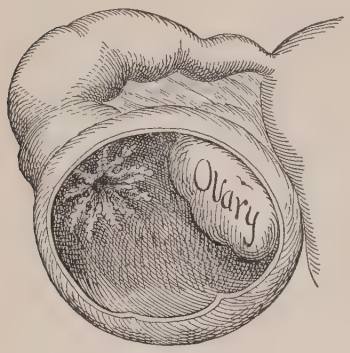


FIG. 482.—OVARIAN HYDROCELE.

Hydrocele of the ovary must be distinguished from a tubo-ovarian cyst. In the former the tube communicates with the cyst by its abdominal opening, which is recognized in rare instances by the presence of the fimbriæ; the ovary is usually found in the wall of the cyst or protrudes into its cavity; and the oviduct is elongated and tortuous, but not distended unless salpingitis is present as a complication. In the latter variety of cyst, on the other hand, the tube communicates with the sac by an adventitious opening; the fimbriæ are not present; the ovary is usually destroyed and replaced by the cyst; and the tube is distended, as the false union between the two organs is always the result of inflammation.

Symptoms.—The symptoms are not characteristic and they differ in no way from those caused by other varieties of tubo-ovarian tumors.

Diagnosis.—The nature of the pelvic enlargement cannot be determined at the bedside, as the physical examination only reveals the presence of a cystic tumor of the ovary.

Treatment.—The tube and ovary should be removed by the abdominal route.

SOLID TUMORS.

Solid tumors of the ovary are comparatively rare, constituting not more than 5 per cent. of all ovarian neoplasms met after puberty; prior to that period, however, they represent about 26 per cent. of the total number of cases.

Diagnosis.—The differential diagnosis between the different varieties of solid tumors of the ovary is usually impossible at the bedside, and a positive opinion cannot be given as to the nature of one of these neoplasms without the aid of the microscope.

The diagnosis is based upon a physical examination which reveals a tumor that is usually movable, not connected with the uterus, and having the general outlines of the ovary. The presence or absence of ascites should be determined, as free fluid in the peritoneal cavity usually points to malignancy, although it may sometimes be associated with a benign growth. It is also important to ascertain the size of the tumor and the rapidity of its growth, as a malignant neoplasm generally attains a large size and develops very quickly.

Treatment.—A solid tumor of the ovary should be removed by the abdominal route as soon as discovered. The possibility of malignancy must always be borne in mind and immediate operative interference advised on account of the uncertainty as to the nature of the growth.

FIBROMA.

Description.—Fibroids of the ovary are of rare occurrence and they seldom grow larger than a lemon, but exceptional cases have been reported of tumors attaining the size of a man's head. The ovary is usually symmetrically enlarged, retains its normal shape, and the tube does not become attached to the growth unless the tumor grows downward between the layers of the broad ligament and becomes intraligamentous. Ovarian fibroids are hard in consistency; they are usually unilateral, but may involve both ovaries; they are always pedunculated except when the growth becomes intraligamentous; and they are liable to the same secondary changes as uterine fibromata. Their presence in the peritoneal cavity frequently causes ascites which prevents adhesions occurring with adjacent structures.

Causes.—Fibroids of the ovary may occur at any age of life. They are met more frequently, however, in young women, but the affection has also been observed in the very young (five years) and in the aged (sixty-six years).

Symptoms.—The symptoms are not characteristic and differ in no way from those caused by other varieties of ovarian tumors. Menstrual disorders are usually present and the patient may suffer with dysmenorrhea or with an irregular or profuse flow. The tumor is not painful, as a rule, unless it attains a large size or becomes wedged in the pelvis. The patient usually complains of more or less pain in one or both iliac regions, which is relieved by the recumbent posture and aggravated when she stands erect or takes exercise. The symptoms in this respect are the same as those of ovarian prolapse and are caused by the displacement of the ovary. The tumor grows slowly, and as it seldom attains a large size the patient may not be aware of its presence.

Diagnosis.—Bimanual examination reveals a pedunculated tumor that is hard in consistency, symmetric in shape, freely movable, and not connected with the uterus. All of these physical signs, however, are present in a pedunculated uterine fibroid, and hence a positive diagnosis is impossible unless both ovaries can be palpated; a probable opinion in favor of the uterine origin of the growth may be given if the uterus is enlarged and nodular.

If an ovarian fibroid grows between the layers of the broad ligament its relations with the uterus are the same as an intraligamentous uterine tumor, and hence a differential diagnosis between them cannot be made at the bedside.

Treatment.—The tumor should be removed by the abdominal route as soon as it is discovered; delay in these cases is dangerous, for we can never be certain that the growth is not malignant.

MYOMA.

A myoma or a fibromyoma is not so rare as a true fibroid.

An ovarian myoma sometimes attains a large size; it is soft in consistency; and, like a fibroma, it may be pedunculated or grow between the layers of the broad ligament.

Treatment.—The tumor should be removed by abdominal section as soon as it is discovered.

SARCOMA.

Description.—Sarcomata are the most frequent variety of solid tumors of the ovary. The affection is not nearly so rare as was generally supposed, and, according to Sutton, the majority of the tumors that were formerly classified as fibromata, myomata, or fibromyomata were in reality sarcomatous in character.

An ovarian sarcoma varies in size from a small lemon to that of an adult's head, and in some cases it may develop into a large abdominal tumor. The growth is smooth and symmetric and the general shape of the ovary is retained. The tumor may be hard or soft in consistency; it is always pedunculated, except when it extends downward between the folds of the broad ligament; and it is accompanied with ascites.

Ovarian sarcomata have the following peculiar points of interest: (1) Both ovaries are involved primarily in about 20 per cent. of the cases. This is contrary to the history of sarcomatous growths in other parts of the body. (2) An ovarian sarcoma, as a rule, develops very rapidly, and it may assume enormous proportions in a few months. (3) In rare cases metastatic nodules may develop simultaneously in remote organs. (4) The stimulating effect of pregnancy causes an ovarian sarcoma to increase very rapidly in size.

Causes.—Sarcomata of the ovary may occur at any period of life. They are met more frequently, however, in young women and children, and cases have been observed not only in the new-born but also in the aged.

Symptoms.—The symptoms are the same as those of ovarian fibroma. The tumor, however, grows more rapidly, attains a larger size, and is associated with cachexia, which appears early in the course of the affection. There is gradual loss of strength and weight.

Diagnosis.—The physical signs are similar to those of ovarian fibroma. The tumor, however, is usually not so hard, and ascites is always present, which is not the case in benign tumors.

A positive diagnosis cannot be made without the aid of the microscope.

Treatment.—The tumor should be removed by the abdominal route as soon as discovered. It is less likely to return after removal than carcinoma.

CARCINOMA.

Description.—Cancer of the ovary may present itself as a *scirrhous*, *medullary*, or *colloid growth*, which begins either as a primary disease or as a secondary infection from another organ, especially the uterus, although it has also been observed in cases of mammary carcinoma. In the majority of instances the disease affects both ovaries. In rare cases primary carcinoma may attack a normal ovary, but the affection is more likely to occur in a cystic or a solid ovarian tumor.

When cancerous degeneration begins in a normal ovary, the organ is symmetrically enlarged and a distinct pedicle is present; but later on, as the disease advances, the tumor becomes round or irregular in shape and its pedicle is destroyed by the infiltration that takes place into the surrounding tissues. The tumor varies in size from a small lemon to that of a man's head, or even larger.

When the disease begins in a solid or a cystic ovarian tumor, the physical characteristics of the original growth are more or less preserved.

Cancer of the ovary may extend to the peritoneum, the uterus, the lymphatic vessels and glands, and to the connective tissue of the pelvis, or metastases may occur in distant organs. As in cancer of other pelvic organs, the disease may involve the ureters or the rectum and cause uremic symptoms or stricture of the bowel.

Causes.—Ovarian carcinoma is more frequently observed between the ages of thirty and sixty years than at any other time of life. The disease, however, may occur before puberty, and cases have also been met in very old women. Primary cancer, which is rarer than the secondary form of the disease, develops more frequently in an ovarian neoplasm than in a normal ovary.

Symptoms.—In the beginning the symptoms are the same as those of benign neoplasms of the ovary. Later on, however, the following symptoms are characteristic of the malignant nature of the tumor: Rapid growth, ascites, chronic peritonitis, edema of the feet and lower limbs, cachexia, and gradual loss of strength and weight.

Cancerous tumors of the ovary grow more rapidly than benign neoplasms and they are associated early in the course of the disease with ascites and chronic peritonitis. The ascitic fluid is usually mixed with blood and it frequently causes marked abdominal distention. The peritonitis is subacute in character and causes more distress than actual pain, which is not, as a rule, acute in ovarian cancer. Edema of the feet and legs occurs early and is a distinctive symptom of the disease. The gradual progressive loss of strength and weight is characteristic of malignancy, and cachexia is a comparatively early symptom.

Death usually results from exhaustion or uremia.

Physical Signs.—A bimanual examination reveals the presence of a tumor which may or may not have the shape of the ovary and which is not connected with the uterus. The growth may be pedunculated or it may be attached by a broad indurated base. It may be hard or soft in consistency and its surface may be smooth or irregular to the touch. If the disease is well advanced and the neighboring structures have become involved, nodular masses are felt in the pelvis (particularly in the culdesac of Douglas) and in the lower abdomen. The ascites is readily detected by combined palpation, and if the ascitic accumulation is marked the abdomen will be distended.

Prognosis.—The disease is very malignant; it develops rapidly and involves adjacent and distant organs; and operative interference offers but little hope of a permanent cure. According to Penrose, "in more than 75 per cent. of the cases operated upon the disease has returned and terminated in death within the first year."

Treatment.—A cancer of the ovary should be removed along with the tube by the abdominal route, provided the disease has not involved the peritoneum or adjacent structures. If the affection has extended beyond the ovary, the removal of the growth would only hasten the death of the patient.

A secondary ovarian cancer is inoperable unless the disease began in the uterus and had not extended beyond the ovary.

BENIGN PAPILLOMATA.

Description.—Solid warty outgrowths springing from the surface of the ovary are a rare occurrence and must not be confounded with papillomata that have perforated the walls of a paroöphoritic cyst.

The warts may be pedunculated or have a broad base, and they vary in size from a very small outgrowth to that of a mass as large as an orange. The disease usually involves both ovaries and often spreads to the peritoneum and the broad ligaments. The affection is generally accompanied by ascites.

Diagnosis.—A positive diagnosis cannot be made at the bedside. A bimanual examination simply reveals the presence of an ovarian enlargement.

Prognosis.—The outgrowths have a tendency to undergo malignant changes.

Treatment.—The enlarged ovary and its tube should be removed by the abdominal route as soon as discovered.

CYSTIC TUMORS.

Cystic tumors may develop from either the outer or the inner part of the ovary. The outer or egg-bearing portion of the organ is called the *oöphoron*, and the inner

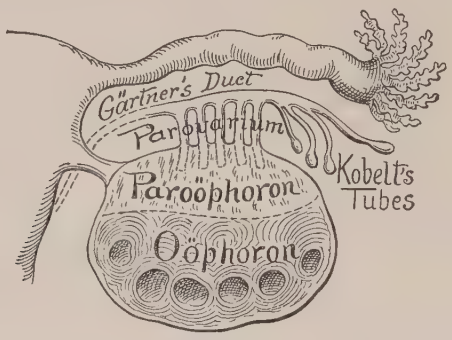


Fig. 483.—Showing the Cystic Regions of the Ovary.

or medullary zone, which never contains Graafian vesicles or ova, is called the *paroöphoron*.

Ovarian cysts are therefore classified, according to the part of the ovary from which they develop, into: **Oöphoritic** and **Paroöphoritic** cysts.

OÖPHORITIC CYSTS.

These cysts are subdivided into:

Follicular cysts.	Glandular cysts.
Cysts of the corpus luteum.	Dermoid cysts.

FOLLICULAR CYSTS.

Synonyms.—Dropsical Graafian follicles; Hydrops follicularis.

Causes.—Follicular cysts of the ovary are due to the failure to rupture and the subsequent distention of a Graafian follicle. This condition may be brought about by the deep situation of the vesicle, by chronic ovaritis causing a thickening of the surface of the ovary or a hyperplasia of its stroma, and by an acute inflammation of the organ, producing deposits of lymph upon it.

The disease may occur at any time between puberty and the menopause.

Pathology.—These cysts vary in size from a hempseed to that of a small lemon, and in exceptional cases they may grow as large as a man's head. The ovary may be occupied by a great number of small cysts, or there may be one large cyst associated with several small ones, or the distended follicles may coalesce and form a single large cyst cavity. The contents of the cyst is composed of a clear, alkaline, serous fluid, having a specific gravity of 1.005 to 1.020, and does not coagulate upon exposure to the air or by heat. Sometimes the fluid may be a chocolate color from the presence of blood, or it may be purulent in character if the cyst becomes infected. An ovum is often found in small cysts, and in exceptional cases even in large sacs. The cyst wall, as a rule, is thin and transparent, but in some cases it is hypertrophied and densely opaque.

The disease is usually bilateral.

Symptoms.—The symptoms depend upon the size of the cystic enlargement, the position of the ovary, and the absence or presence of adhesions. So long as the ovary is but slightly enlarged and remains in its normal position, the symptoms are similar to those of chronic ovaritis; but when the organ becomes displaced and falls down into the culdesac of Douglas, the local and general manifestations of ovarian prolapse become apparent.

Pain is the most prominent symptom of follicular distention of the ovary, and it is decidedly more marked when the cyst is prolapsed or adherent. This symptom is always more severe in small ovarian tumors than in large growths extending into the abdominal cavity, owing to the fact that the former crowd the pelvic organs and cause painful pressure symptoms. The function of menstruation is apt to be disturbed in cases of follicular cyst, and menorrhagia or metrorrhagia is frequently observed.

Diagnosis.—A positive diagnosis of the nature of the ovarian enlargement cannot be made at the bedside.

The diagnosis is based upon the physical examination and the history of the patient.

The bimanual examination reveals an enlarged ovary at the side of the uterus or in the culdesac of Douglas. If the cyst has attained the size of an egg, we may be able to elicit fluctuation or elasticity, otherwise the altered consistency of the ovary cannot be detected. The disease is usually bilateral and the enlarged ovaries are frequently fixed by adhesions.

The symptoms show the chronic nature and slow development of the enlargement.

Prognosis.—The disease does not endanger the patient's life unless the cyst becomes infected and an ovarian abscess develops. The general health and usefulness of the woman are, however, seriously impaired by the menstrual disturbances and the constant pain and distress in the pelvis.

Treatment.—The treatment of follicular cysts of the ovary is operative, as no local or general palliative measures are curative in the slightest degree. The indication for surgical interference is usually determined by the severity of the local symptoms; but the mere presence of the ovarian tumor should be sufficient reason for the medical attendant to advise an abdominal section, owing to the impossibility of knowing the exact nature of the growth and the danger of its being malignant.

At the time of operation the surgeon must be guided by the character and extent of the ovarian lesions in deciding between a salpingo-oöphorectomy and a conservative surgical measure. This is not so important when only one ovary is involved as it is when the disease is bilateral and the woman is anxious for children.

If the disease is unilateral, salpingo-oöphorectomy, as a rule, is indicated. If, however, both ovaries are affected and the patient desires children, a conservative operation should be performed and as much of the ovary as possible should be saved. Under these circumstances the small cysts should be punctured with a bistoury and their contents allowed to escape. A large cyst should also be incised, its wall removed, and the edges of the wound brought together with a continuous suture of fine catgut or silk to control the bleeding and close the incision.

CYSTS OF THE CORPUS LUTEUM.

These cysts are rare in women, but they are extremely common in such domestic animals as the cow, mare, sow, and ewe. They occur not only in women who have borne children, but also in nulliparæ, and hence they do not develop

from the corpus luteum of pregnancy alone. As a rule, the cysts are not larger than a cherry or a walnut, but cases have, however, been met in which the tumor attained larger proportions and reached the dimensions of a man's head. The cyst wall is thick and of a bright yellow color and the sac is filled with an albuminous fluid.

GLANDULAR CYSTS.

Synonyms.—Proliferous glandular cysts; Ovarian adenomata; Multilocular ovarian cysts; Myxoid cystomata.

Causes.—These cysts are probably congenital in origin and are developed from embryonic structures in the ovary known as the *tubes of Pflüger,* which normally become converted into the Graafian follicles, but which may sometimes persist after intrauterine life and eventually undergo cystic degeneration.

This variety of cystoma is by far the most common form of ovarian neoplasm —cystic or solid; and while it may occur at any period of life, the greatest number of cases are observed between twenty and fifty years of age.

Description.—A glandular cyst of the ovary may grow to enormous proportions and fill the abdominal cavity so completely that the thoracic viscera are encroached upon. The shape of the tumor is spheric or ovoidal, but its general outlines are often changed when the cyst becomes crowded against the abdominal or pelvic viscera.

The surface of the cyst, as a rule, is smooth and has a pearly white, glistening appearance. Sometimes, however, the contents of the cyst may give it a different color, or it may be roughened by inflammatory exudates and adhesions. Sometimes the outline of the tumor may be altered and its surface become more or less nodular from the presence of follicular and mucous cysts in its walls. As a rule, the normal ovarian tissue is destroyed when the tumor reaches the size of a man's head, but in rare instances this does not take place and a corpus luteum may be seen on the surface of a large cyst.

A glandular cyst in nearly every instance grows into the peritoneal cavity and not between the folds of the broad ligament. It is, therefore, an intraperitoneal growth except in those rare instances where the tumor is extraperitoneal and develops between the layers of the broad ligament; in these exceptional cases the cause may have been due to an abnormal position of the ovary itself.

Glandular cysts are always multilocular, that is, they consist of a large number of cyst cavities varying in size and in the character of their contents. In the beginning the number of daughter cysts is very great, but as the tumor grows the walls of separation are frequently absorbed, and eventually a cyst may become unilocular in character from a surgical standpoint, although even in these cases a careful examination will generally reveal a few secondary cavities or the partial remains of septa.

Ovarian adenomata are unilateral in the vast majority of cases, but occasionally the disease may be bilateral and, as a rule, the cysts are unequally developed, although cases have been observed in which large cystic ovaries were adherent and formed a single tumor having two pedicles.

This variety of cyst is attached by a pedicle which consists of the oviduct and the broad and ovarian ligaments, and which becomes hypertrophied and elongated as the tumor develops.

The contents of glandular cysts vary greatly in color and consistency, and it is no unusual experience to find different fluids in the daughter cysts of the same tumor. As a rule, however, the fluid is more or less viscid, of a clear straw color and alkaline reaction. It has a specific gravity of from 1.010 to 1.062, and is coagulated by heat, but rarely by exposure to the air. In some instances the

ovarian fluid may be thin and limpid, or, again, it may be as thick and tenacious as oil or syrup, or it may even have the consistency of jelly; it may be translucent or opaque; and, finally, it may have a gray, yellow, brown, or black color.

DERMOID CYSTS.

Causes.—The origin of dermoid cysts is not known, and many more or less ingenious theories have been advanced from time to time to account for their presence in the ovaries and in other parts of the body.

Dermoid cysts of the ovary occur at all ages; no period of life is exempt; and they have even been known to develop during intrauterine life. They are the most common variety of ovarian tumor prior to puberty, and after that period they constitute about 4 per cent. of the cases.

Description.—These tumors seldom attain to a size larger than a man's head except where they are associated with a proligerous cyst or where they become infected and their fluid contents increase in quantity. The outer surface of the cyst is generally of a dull gray hue, and not infrequently it may present a brownish-yellow color, and the inner aspect is covered to a greater or lesser extent with a membrane resembling skin in appearance and structure. Ovarian dermoids, like proligerous cysts, are generally intraperitoneal tumors, but they may, however, grow between the layers of the broad ligament and become intraligamentous or extraperitoneal in situation. Dermoid cysts are unilocular, but in some cases they may be apparently multilocular in character when they are associated with a proligerous cyst or there are two or more dermoids springing from the same ovary.

In four-fifths of the cases the affection is unilateral. Sometimes the ovary may be the seat of only one cyst, or it may contain several dermoids which may finally coalesce and form a single large cavity or else communicate with each other by adventitious openings. In some instances a woman may have a dermoid cyst in one ovary and a proligerous tumor in the other, or, again, she may have both varieties in one organ—*mixed tumor*. Like proligerous cysts, ovarian dermoids are attached by a pedicle which is composed of the same structures,—the oviduct and the broad and ovarian ligaments,—and which likewise becomes thickened and elongated as the tumor develops.

Dermoid cysts usually develop very slowly or they may remain quiescent for a lifetime without causing any inconvenience. When, however, they become inflamed or are associated with a glandular tumor, they develop very rapidly and cause distressing symptoms. These cysts are frequently adherent to the surrounding structures, and they may eventually either rupture into one of the hollow viscera or form adhesions with the abdominal wall and discharge their contents through a sinus. The contents of the cyst are extremely irritating to the peritoneum and their escape into the peritoneal cavity may be followed by peritonitis. Sometimes under these circumstances the epithelial elements contained in the fluid contents of the cyst may become implanted upon the peritoneum and develop into secondary growths. Cystic degeneration occasionally occurs in the sebaceous and sudorific glands of the tumor and secondary cysts are formed which give the walls a lobulated appearance.

The following structures have been found in dermoid cysts of the ovary: Sebaceous glands, sudorific glands, mucous membrane, hair, teeth, horn, cartilage, bone, mammary gland, unstriped muscle fibers, brain-like tissue, nerves, a trachea, a heart, and an eye.

The sebaceous are more numerous than the sudorific glands and the latter usually occur in bunches. The mucous membrane found in these cysts resembles

that of the stomach and intestines. The hair may be present in great abundance or the cyst may contain only a very small quantity. Sometimes it forms a switch or tuft several inches or feet long rolled up into a ball which is held together by sebaceous matter; and, again, a number of small balls of hair and sebaceous matter may be found lying in the cavity of the cyst. As a rule, the hair is only several inches in length, but in a case reported by Mundé the tuft was fully five feet long. The color varies and does not usually correspond with that on the patient's head. In old women the hair is apt to turn gray or white in color, and often falls out, leaving bald spots on the inner surface of the cyst.

Teeth are found in the majority of ovarian dermoids. They are usually imbedded in loose bone or cartilage; in some cases they are situated in the wall of the cyst or are found scattered throughout the tumor when they are present in very great number, and in others they are unattached and free in the cavity of the neoplasm. A dermoid cyst rarely contains more than ten or fifteen teeth, but occasionally a large number are found, and as many as three or four hundred have been removed from a single tumor. Dermoid teeth, as a rule, have only a single root and resemble canines and incisors in shape and construction. They are frequently well developed, or they may be malformed and show evidence of decay or erosion. Some writers claim that they may be shed like the temporary teeth in the mouth, and cases have been reported in which a decayed tooth was found directly over a sound one imbedded in a piece of bone; the pulps of dermoid teeth are usually supplied with nerves. Bones are frequently found in dermoid cysts. They are usually imbedded in the wall and are irregular or flat in shape. Rudimentary or perfectly developed mammary glands and nipples are more or less commonly met.

The fluid contents of an ovarian dermoid may consist of a pultaceous mass of sebaceous matter mixed with hair or an oily fat of a brownish-yellow color. The consistency varies from an oily fluid to that of a semi-solid material, and sometimes the cyst cavity is filled with hard balls of fat more or less mixed with short hairs. The contents of a dermoid solidifies when exposed to the air.

PAROÖPHORITIC CYSTS.

These cysts are known as:

PAPILLARY CYSTS.

Causes.—A paroöphoritic cyst springs from the paroöphoron or the hilum of the ovary, and is probably congenital in origin, being developed from the remains of the Wolffian body. These cysts are not often met early in life and the greatest number of cases are observed between thirty and fifty years of age. They occur less frequently than the glandular variety and constitute about 10 per cent. of the total number of the cases of large ovarian cysts.

Description.—Papillary cysts rarely reach a size larger than a man's head and develop much slower, as a rule, than the glandular variety. They may grow either as intraperitoneal tumors or, on account of springing from the hilum of the ovary or the paroöphoron, they may become extraperitoneal and grow between the layers of the broad ligament. The latter direction of development probably occurs more frequently than the former, although many of these cysts have a distinct pedicle composed of the oviduct and the broad and ovarian ligaments. An intraligamentous papillary cyst may force its way against the side of the uterus, and in that position it will present all of the physical signs of a uterine growth extending laterally between the folds of the broad ligament.

According to Penrose, "papillomatous cysts are more often bilateral than any other cystic tumor of the ovary. They affect both ovaries in from 50 to 75 per cent. of the cases." Papillary cysts of the ovary are generally unilocular.

The occurrence of papillomata or warts upon the inner surface of the cyst wall is a distinctive feature of paroöphoritic cysts. The outgrowths are soft and friable; they bleed readily when handled; they may be pedunculated or are attached to the cyst wall by a broad base; and they are either pale or reddish in color according to the richness of the vascular supply. They vary in size from a small wart to that of a large, cauliflower-like mass the size of a child's head. The smaller warts may be distributed generally over the cyst wall or they may be arranged in groups or clusters. Sometimes calcareous degeneration occurs, and under these circumstances it is not uncommon to find small solid bodies resembling grains of sand scattered throughout a large papillomatous outgrowth.

The papillary growths in these tumors show a marked tendency to perforate the cyst wall and escape into the peritoneal cavity. The rupture of the cyst under these circumstances is due either to the direct pressure exerted by the excrescences or to fatty degeneration or atrophy of the cyst wall itself. The cases in which perforation occurs should not be mistaken for benign papillomata springing from the surface of a healthy ovary.

The warts and fluid contents of these cysts infect the tissues with which they come in contact and secondary papillomatous outgrowths result. When a cyst ruptures either spontaneously or at the time of operation, secondary warty formations develop upon the peritoneum. These new outgrowths are often found scattered throughout the peritoneal cavity, but they are, however, always more numerous in the culdesac of Douglas and on the mesentery and the omentum. Sometimes the abdominal opening may become infected during the removal of a papillomatous tumor and a secondary growth may develop in the line of incision. An adherent cyst may rupture into a hollow viscus, and hence warty masses may be expelled from the cavity of the uterus, the rectum, or the bladder. Ascites usually develops when the peritoneum becomes infected with papillary outgrowths, and consequently the presence of free fluid in the abdominal cavity in connection with an ovarian cyst points to the possibility of the tumor being papillomatous.

The fluid contained in a papillary cyst is watery in consistency; of a clear, light yellow color, which may change to a reddish-brown from the occurrence of an intracystic hemorrhage; and has a specific gravity of 1.005 to 1.040.

GENERAL CONSIDERATION OF OVARIAN CYSTS.

SYMPTOMS.

The symptoms of an ovarian cyst usually develop very gradually and the tumor may often extend into the abdomen before they are sufficiently well marked to call the patient's attention to the pathologic condition within the pelvis. None of the symptoms are pathognomonic, and they do not differ from those caused by other pelvic neoplasms which produce the same degree of pressure and the same amount of congestion in the organs of the pelvis.

The symptoms may be conveniently studied under the following headings:

Pressure symptoms.
Menstrual disorders.
Sterility.
General symptoms.

Pressure Symptoms.—The pressure symptoms caused by ovarian cysts are seldom observed at the present day, as these growths are usually removed before they attain to a large size. If the tumor is intraperitoneal in development and is not bound down by adhesions, it usually ascends easily into the abdomen without causing much disturbance in the pelvis. But if the growth develops between the layers of the broad ligament or becomes adherent, serious symptoms arise due to direct pressure upon the adjacent organs. After the cyst ascends into the abdomen it crowds and displaces the abdominal organs and eventually encroaches upon the thoracic viscera.

The chief pressure symptoms are:

Constipation and hemorrhoids.
Irritable bladder.
Urinary disorders.
Digestive disturbances.
Respiratory and cardiac disorders.
Ascites; Edema.
Pelvic and reflex pains.

Constipation and Hemorrhoids.—The rectum may be encroached upon and chronic constipation, hemorrhoids, or partial obstruction result.

Irritable Bladder.—Pressure upon the bladder lessens its holding capacity and causes frequent urination. A large cyst may pull the bladder and urethra upward and produce vesical irritability or retention.

Urinary Disorders.—Encroachment upon one or both of the ureters mechanically interferes with the flow of urine and causes hydronephrosis if the obstruction is complete. Pressure on the renal vessels may result in albuminuria.

Digestive Disturbances.—A large cyst that extends well into the abdomen crowds the abdominal organs and causes various gastro-intestinal disturbances. Nausea and vomiting are common symptoms; the appetite and digestion are usually impaired; catarrhal jaundice may develop when the liver and the bile-ducts are pressed upon by the cyst; and intestinal obstruction may result if a knuckle of gut becomes kinked.

Respiratory and Cardiac Disorders.—When the cyst fills the entire abdomen and encroaches upon the thorax, the symptoms become marked and distressing. The patient suffers from dyspnea and irregular heart-action. The lower portion of the lungs is often found to be in a state of partial collapse and the presence of a pleural effusion is not an infrequent complication. If the pressure exerted by the cyst is very great, the lower ribs become spread apart and the intercostal spaces are increased in width.

Ascites and Edema.—Ascites is not an uncommon occurrence when the cyst encroaches upon the vena cava and pressure upon the iliac veins causes edema of the legs, the vulva, and the vagina. The abdominal wall may be overstretched and very thin or it may be edematous; and linea albicantes, dilated veins, and pigmentation are frequently observed upon the surface of the abdomen.

Pelvic and Reflex Pains.—Pelvic pain is a more or less constant symptom in small cysts. It is bearing-down or dragging in character and situated in the iliac region, and may radiate into the hips, the back, the rectum, or down the thighs. A reflex pain is often felt in one of the breasts and in the head.

Menstrual Disorders.—Menstrual disturbances are not so common as would be supposed when we consider the character of the lesion. Menorrhagia is observed in small adherent cysts and in intraligamentous growths. It also occurs in women who have passed the menopause, from congestion caused by the cyst in the uterus and adjacent organs. Obstinate menorrhagia or met-

rorrhagia is an early symptom in bilateral cysts and in broad ligament tumors. Amenorrhea is not an uncommon symptom late in the course of the disease when the ovarian tissue is more or less destroyed and the patient is anemic and exhausted. Dysmenorrhea is not a frequent symptom and is present, as a rule, only in small tumors that have become adherent or fixed in the pelvis or have developed between the layers of the broad ligament.

Sterility.—Pregnancy is a comparatively rare occurrence in women suffering with an ovarian cyst, not only because of the pathologic changes in the ovary itself, but also because the distorted and misplaced condition of the pelvic organs prevents the ovum from escaping into the tube. Conception, however, has taken place in cases where both ovaries were the seat of cystic enlargement; this has happened not only in glandular but also in dermoid cysts.

General Symptoms.—The general health, as a rule, is not affected in the beginning of the disease unless the cyst is adherent in the pelvis or develops between the layers of the broad ligament, in which case the severity of the pressure symptoms causes the patient to lose strength and weight. After the cyst has extended into the abdomen and begins to exert compression upon the abdominal and thoracic viscera the general health is rapidly impaired and the patient becomes progressively enfeebled and emaciated. In the later stages of the disease the face of the patient has a somewhat characteristic expression, which is called the *facies ovariana*, and which is due to the extreme emaciation and the constant suffering and sleeplessness. Toward the end of the disease the appetite is entirely lost, the tongue becomes parched, an aphthous stomatitis may develop, and there is usually persistent nausea and vomiting.

Reflex disturbances are occasionally observed in the mammary glands, and at times the areola become pigmented, the breasts enlarged, and a milky secretion may be expressed from the nipples.

COMPLICATIONS.

The chief complications met in ovarian cysts are:

Inflammation.
Hemorrhage.
Twisting of the pedicle.
Rupture.
Adhesions.

Inflammation.—Causes.—The chief channels of infection are the neighboring organs—namely, the Fallopian tubes, the intestines, the urinary bladder, and the vermiform appendix. The most common sources are the Fallopian tubes and the intestines. Tapping is also a cause, and when this procedure was formerly employed in the treatment of ovarian cysts it was frequently responsible for many of the cases of suppurative inflammation. Small adherent pelvic cysts are more liable to inflammation than large abdominal tumors, as the former are in close contact with the rectum and therefore more exposed to the influence of pathogenic germs. While all ovarian cysts are more or less likely to become infected, the complication is most frequently met in dermoids, and in these cases the inflammation usually goes on to suppuration.

Results.—The most serious results of inflammation in an ovarian cyst are adhesions and suppuration. The adhesions may be limited to a few bands of organized lymph uniting the cyst at one or more points with the surrounding structures, or they may be universal in character and render the removal of the growth difficult or even impossible. If suppuration occurs in a unilocular cyst, the entire contents become purulent, but in a multilocular growth only one or

more loculi may be affected. Suppurative cysts form dense and universal adhesions; they may rupture into the peritoneum, the bladder, the rectum, the intestine, or through the abdominal wall; and it is not an uncommon occurrence for one of these tumors to contain a large quantity of gas that is generated from decomposition in the cyst cavity itself or passes directly into it through an adventitious communication with the bowel. The rupture of a suppurating dermoid into one of the hollow viscera is followed by inflammation, and several cases have been reported in which fragments of the contents of these cysts have formed the nucleus of a vesical calculus.

Symptoms.—The symptoms of acute suppuration in an ovarian tumor are characteristic. The cyst suddenly increases in size; there is severe pain and tenderness over the growth; the pulse is rapid and weak; the temperature is high; and there is marked loss of strength and weight. The kidneys are frequently affected and symptoms of acute nephritis are often present. If the tumor contains gas, the percussion-note is tympanitic.

The symptoms of inflammation without suppuration are not so marked nor severe, and they resemble more or less those of local peritonitis—pain and tenderness over the tumor, with but little if any constitutional disturbance. When, however, the inflammation becomes general, the pulse and temperature are affected, but the symptoms of profound sepsis are absent, and hence there is not the exhaustion and emaciation that are seen in purulent cases.

Prognosis.—Inflammation of an ovarian cyst is always a grave condition. If suppuration occurs and the pus does not find an outlet, the patient dies. If an adventitious opening is formed and the pus escapes spontaneously, the patient also eventually dies from exhaustion unless she is relieved by surgical interference.

Treatment.—Immediate ovariotomy is indicated.

Hemorrhage.—**Causes.**—Small hemorrhages into an ovarian cyst are of frequent occurrence and give a dark red or chocolate color to the fluid contents. The most common cause of intracystic hemorrhage is torsion of the pedicle; it may also occur in paroöphoritic cysts, on account of the friable nature and vascularity of the papillary outgrowths; and it sometimes results from a blow or fall upon the abdomen, or it may be due to a penetrating wound of the abdominal wall. In some cases ulcerative changes in the cyst itself may produce a hemorrhage, and in others a vessel may rupture in a partition that is undergoing absorption.

Symptoms.—A slight hemorrhage gives rise to no symptoms. A severe hemorrhage, on the other hand, is characterized by more or less shock and the usual signs of internal bleeding.

Prognosis.—The hemorrhage, as a rule, is slight and of no practical importance. Sometimes, however, in cases of acute torsion and penetrating wounds of the abdomen the bleeding may be so severe as to threaten life.

Treatment.—Immediate ovariotomy is indicated.

Twisting of the Pedicle.—**Causes.**—Twisting of the pedicle of an ovarian tumor is not so frequently observed at the present time as formerly, when these tumors were allowed to attain a large size before they were removed, and hence the old statistics which placed the frequency of this accident as 10 per cent. of all the cases is now incorrect.

This complication may be caused by any condition that produces an axial rotation of the tumor, and consequently it may be due to the following conditions: The peristaltic action of the intestines; the passage of fecal matter through the rectum; the alternate distention and evacuation of the bladder; the development of secondary cysts which change the shape and the position of the tumor; the

presence of a gravid uterus or the occurrence of a cystic enlargement in both ovaries; and sudden or unusual movements upon the part of the patient.

Torsion of the pedicle cannot occur if the tumor is adherent or is impacted in the pelvis. The accident is more likely to occur in small than in very large tumors and in cysts in which the pedicle is long and slender. Dermoid cysts are more likely to undergo axial rotation than other ovarian tumors, and hence twisting of the pedicle is comparatively frequent in this variety of cystic growth.

Pathology.—Twisting of the pedicle may occur as a *slow* or *rapid process*.

In cases of slow torsion the pathologic changes are gradually brought about and are seldom grave in character. The blood-vessels in the pedicle slowly become constricted and passive congestion occurs in the cyst, which may finally result in a slight intracystic hemorrhage. Under these circumstances the cyst contents become dark brown or chocolate in color and small extravasations of blood are found in the cyst wall. If the process of torsion continues, adhesions usually form between the cyst and the surrounding structures. These adhesions eventually become vascular and nourish the tumor in case the pedicle becomes severed or the circulation completely obstructed. This form of transplantation by adhesions is more frequently observed in dermoid cysts than in other varieties of ovarian growths. In rare instances torsion has effected a spontaneous cure by diminishing the blood-supply and causing atrophy or fatty degeneration to take place in the cyst. Sometimes the pedicle may be gradually severed without adhesions occurring between the cyst and the adjacent parts, and occasionally tumors have been found in the abdominal cavity without any attachments whatever. Slow torsion occurs more frequently in comparatively large tumors than in small growths. When adhesions exist between the cyst and the intestines axial rotation of the tumor may cause obstruction of the bowels. The number of twists in the pedicle varies in different cases. In some instances only a partial torsion takes place, and in others the pedicle may be completely twisted upon itself ten or twelve times. The direction of the axial rotation of the cyst also varies, and it has been found to occur from right to left and from left to right with about equal frequency.

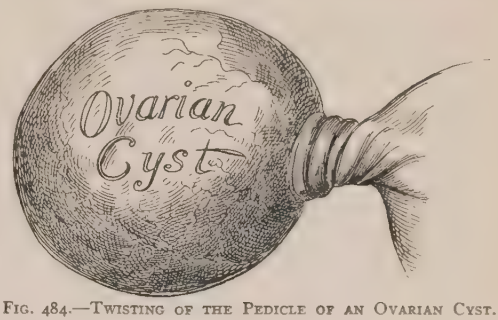


FIG. 484.—TWISTING OF THE PEDICLE OF AN OVARIAN CYST.

Rapid torsion of the pedicle brings about quick and grave pathologic changes in the cyst. The blood-vessels in the pedicle are suddenly obstructed and the tumor rapidly becomes edematous and engorged with blood. If the strangulation continues, suppuration and gangrene followed by peritonitis may result and end the patient's life. Extravasations of blood, as a rule, take place in the cyst wall, and sometimes the larger veins may rupture, causing a profuse intracystic hemorrhage which may endanger life from acute anemia. In some cases the bleeding is so severe that the sac becomes quickly distended and may even rupture and discharge its contents into the abdominal cavity. Rapid torsion of the pedicle occurs more frequently in small cysts than in large tumors.

Symptoms.—The symptoms depend upon the rapidity with which torsion takes place and also upon the extent to which the vessels of the pedicle are constricted.

Slow Torsion.—The symptoms are not characteristic and a positive

diagnosis cannot be made. "Dull constant abdominal pains in a patient who keeps in good health and bears a cystic tumor that increases but little or not at all in the course of several months or years is a suspicious symptom" (Doran).

Rapid Torsion.—The symptoms are marked and often so distinctive that the diagnosis is easily made. They are: Sudden enlargement of the tumor; severe abdominal pains accompanied with nausea and vomiting; and in some cases signs of internal hemorrhage or of beginning peritonitis.

The symptoms of rapid torsion of the pedicle must be distinguished from those caused by a ruptured tubal pregnancy.

Prognosis.—*Slow torsion* seldom causes grave symptoms or endangers life. *Rapid torsion* may cause death from hemorrhage, sepsis, or peritonitis. Immediate ovariotomy is usually followed by good results.

Treatment.—Ovariotomy is indicated in both slow and rapid torsion.

Rupture.—Causes.—The rupture of an ovarian cyst is not an uncommon occurrence.

The accident may be due to:

Overdistention of the cyst wall.
Degeneration of the cyst wall.
Perforation of the cyst wall.
Traumatism.

Overdistention.—The general increase of the fluid contents of the cyst which naturally takes place as the tumor develops causes the walls to become so thin and overstretched that they may give way at any time, and occasionally a profuse intracystic hemorrhage due to rapid torsion of the pedicle may result in rupture from sudden overdistention of the sac.

Degeneration.—The cyst wall is often weakened by degenerative changes and a rupture may occur from atrophy due to continuous intracystic pressure, or from fatty degeneration, inflammation, suppuration, and gangrene.

Perforation.—Rupture due to perforation is a frequent occurrence in papillary cysts. This accident is fully discussed under paroöphoritic cysts.

Traumatism.—Various forms of traumatism may result in rupture, and the cyst wall may be torn by blows, falls, sudden jars, unusual movements upon the part of the patient, rough manipulations during a bimanual examination, contraction of the abdominal muscles in labor, or straining at stool and perforating wounds of the abdomen.

Results.—When a multilocular cyst ruptures the fluid contained in the secondary cysts does not escape, and hence the cyst is only partially emptied of its contents. The rupture of a unilocular cyst, on the other hand, is usually followed by the escape of all its fluid contents, and hence in these cases a spontaneous cure may be effected. A multilocular cyst, however, is never cured by tapping or by spontaneous rupture.

The rupture of an ovarian cyst is generally attended with hemorrhage, which is, however, seldom profuse, because the ruptured portion of the cyst wall is thin and not supplied with large blood-vessels. A severe and suddenly fatal hemorrhage is nearly always caused by rapid torsion of the pedicle and not by conditions that are gradual in their development and results.

The effect upon the peritoneum from the rupture of an ovarian cystoma depends entirely upon the character of the tumor, and if the fluid is unirritating it is easily absorbed and eliminated by the kidneys even when the quantity is large. If the contents are mucoid or colloid in character, they irritate the peritoneum and either cause a severe inflammation or they produce secondary peritoneal growths of a tough gelatinous nature, varying in color from gray to yellow and scattered in masses throughout the abdominal and pelvic cavities. When a papillary,

malignant, or dermoid cyst ruptures, its contents are scattered throughout the peritoneal cavity and similar secondary growths are engrafted upon the peritoneum. The rupture of a septic ovarian cyst is followed by a fatal peritonitis.

An ovarian cyst ruptures most frequently into the peritoneal cavity, the rectum, the bladder, or the vagina, and in rare instances into the intestines, the oviduct, the stomach, the uterus, or the abdominal wall. The adventitious opening seldom closes permanently and the contents of the sac are more or less continuously discharged through the hollow viscus into which the rupture originally occurred. Sometimes when the cyst communicates with the rectum or the intestines, the gases pass into the sac and give a tympanitic note upon percussion over the tumor.

Symptoms.—The character of the symptoms depends upon the nature of the cyst and the quantity of the escaped fluid.

The following are the chief symptoms:

Sudden abdominal pain.
Diuresis.
Disappearance or alteration in the shape of a tumor.
The presence of free fluid in the abdominal cavity.
Peritonitis.
Reaccumulation of fluid in the cyst.

Abdominal Pain.—Sudden abdominal pain is a constant symptom in all cases of rupture. It varies, however, in intensity, and in some cases the patient experiences a sharp acute pain, not very severe in character, which gives her a sensation of something having snapped or given way in the abdomen; in others the symptom is so agonizing and intense that the woman is thrown into a state of profound collapse.

Diuresis.—Diuresis is a symptom that appears soon after the actual rupture of the cyst. If the quantity of the escaped fluid is small, there is no appreciable increase in the amount of urine, but if a large monocystic tumor has ruptured, the kidneys become very active and the patient may pass several gallons of water within the first twelve or twenty-four hours.

Disappearance or Alteration in the Shape of a Tumor.—The sac of a monocystic growth collapses when rupture occurs, and hence the tumor disappears completely and the abdomen becomes flat and flabby. But in the case of a multilocular growth the presence of secondary cysts prevents the entire disappearance of the tumor, and consequently, while it may be much smaller in size or altered in shape after the accident, it is still easily recognized by palpation.

Free Fluid in the Abdominal Cavity.—The presence of free fluid in the abdominal cavity, considered in connection with the other symptoms, is strong confirmatory evidence in favor of rupture having occurred, especially in those cases in which there had been no previous signs of ascites.

Peritonitis.—Inflammation of the peritoneum occurs only in those cases in which the escaped fluid is septic or of a nature to cause irritation; the symptoms of peritonitis do not appear, as a rule, until several hours after rupture has occurred.

Reaccumulation of Fluid in the Cyst.—The reaccumulation of the fluid in the cyst occurs too late to be of any value in determining the question of rupture at the time of the accident. If, however, the patient gives a history of the sudden disappearance of a tumor and its subsequent recurrence, the probable indications are that such a complication had taken place at some previous period.

Prognosis.—The prognosis depends upon the character of the escaped fluid and the promptness with which surgical interference is instituted.

Treatment.—Immediate ovariotomy is indicated in all cases.

Adhesions.—Ovarian tumors are frequently complicated by adhesions which are caused either by inflammation or by the columnar epithelium being rubbed off by friction against the surrounding structures. They vary in extent from one or more slight fibrous bands binding the cyst to a knuckle of intestine or to some other organ, to a firm and intimate union between the tumor and all of the surrounding structures. A cyst that is universally adherent presents a shaggy appearance after its removal. Pelvic adhesions are especially dangerous on account of the liability of wounding a ureter or one of the large blood-vessels when the cyst is enucleated. Sometimes a kink may occur and intestinal obstruction result, or a fibrous band may surround the gut and completely occlude its lumen. Old adhesions are often very vascular, especially when they are connected with the omentum or the intestines, and in cases where the pedicle has been severed by torsion the tumor may be nourished by the blood-vessels which they contain.

It is very difficult or even impossible to determine the character and extent of abdominal adhesions at the bedside, and their true nature therefore cannot be recognized until the time of operation. This is due to the fact that the intestines have a wide range of mobility, and even if the tumor is extensively adherent to them it can usually be pushed freely about in various directions. Pelvic adhesions, on the other hand, are more readily palpated, and we are generally able to determine their character by estimating the mobility of the tumor and its connections with the adjacent organs.

DIAGNOSIS.

The diagnosis of an uncomplicated ovarian cyst is seldom difficult at the bedside; but it is often impossible to distinguish between the different varieties and to recognize existing complications prior to the time of operation. Such a distinction, however, is of no practical value, as all ovarian tumors demand the same treatment—ovariotomy.

The *history* and the *symptoms* of the patient are of but little diagnostic importance, as they neither prove nor disprove the presence of an ovarian cyst, and a positive diagnosis must, therefore, depend upon the physical signs which are elicited by the examination.

For purposes of diagnosis we distinguish the following stages in the growth of an ovarian cyst:

Pelvic stage.
Abdominal stage.

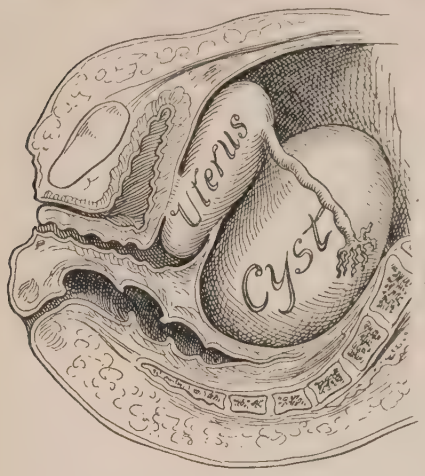
Pelvic Stage.—During this period in the development of an ovarian cyst it is entirely within the pelvic cavity and the diagnosis is based upon its recognition by bimanual palpation.

The bowels and bladder are emptied; the patient placed in the dorsal position on an examining table; and the examination made by *vagino-abdominal* and *recto-abdominal palpation*.

The following physical signs are elicited:

The position of the cyst.
The mobility of the cyst.
The relations of the cyst.
The shape of the cyst.
The consistency of the cyst.

The Position of the Cyst.—The increased weight of the ovary causes it to be displaced, and hence we usually feel the cyst low down in the pelvis. As a



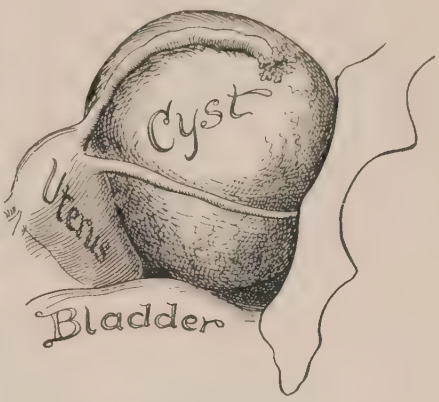


FIG. 485. FIG. 486.

POSITION OF AN OVARIAN AND BROAD LIGAMENT CYST.

Fig. 485 shows an ovarian cyst in the culdesac of Douglas pushing the uterus forward; Fig. 486 shows a broad ligament cyst displacing the uterus laterally.

rule, an intraperitoneal cyst occupies the culdesac of Douglas, but in some cases it may be to one side of or behind the uterus. A broad ligament cystoma, how-

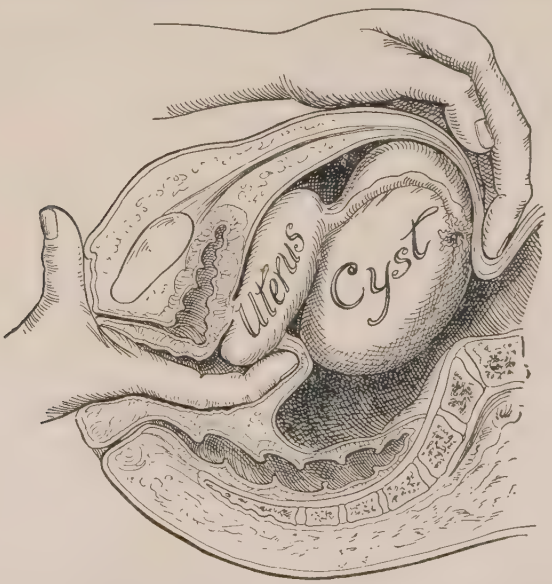


FIG. 487.—SHOWING THE METHOD OF TESTING THE MOBILITY OF AN OVARIAN CYST (page 534).

Note that the cyst is pushed upward by the internal finger and pulled forward by the fingers of the external hand.

ever, is always low down in the pelvis and close to the side of the uterus, and as it develops the womb is pushed against the lateral wall of the pelvic cavity.

The Mobility of the Cyst.—An intraperitoneal cyst that is not adherent may be moved about freely in the pelvis and even pushed up into the abdomen if its pedicle is sufficiently long. An intraligamentous cyst, on the other hand, is fixed and cannot be displaced by the examining fingers (Fig. 487).

The Relations of the Cyst.—The relations of the cyst reveal its origin, and it is therefore necessary to determine the connections existing between it and the uterus. An intraperitoneal tumor may be moved about independently of the uterus unless it is adherent, but an intraligamentous cyst, however, is so closely connected with the womb, on account of its position between the layers of the broad ligament, that such an independent movement is impossible. The recognition of a pedicle still further confirms the ovarian origin of the tumor, and this is accomplished by recto-abdominal touch while an assistant pulls down the cervix with bullet forceps. Under these circumstances the pedicle is put upon the stretch, and it may usually be felt by the examining finger as a more or less tense cord-like structure. The origin of the neoplasm is also shown by a groove or

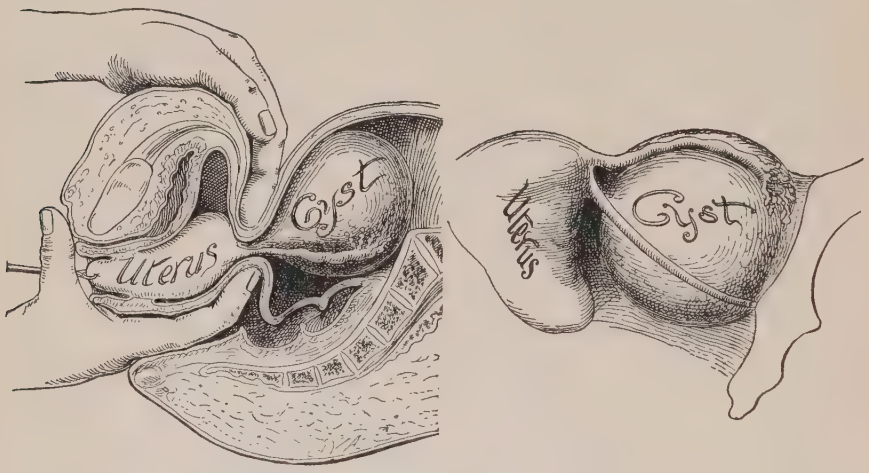


Fig. 488. Fig. 489.

Methods of Determining the Relations of a Cyst.

Fig. 488 shows the pedicle of an ovarian cyst being palpated by recto-abdominal touch combined with artificial uterine prolapse; Fig. 489 shows the separation or groove that exists between the uterus and a cyst.

furrow which exists between it and the uterus; this sign is present in both intraperitoneal and broad ligament cysts.

The Shape of the Cyst.—The shape of the tumor is round or ovoid and its surface is smooth and regular in outline. A medium-sized multilocular cyst, however, may have an irregular shape and its surface may be nodular from the presence of secondary cysts, and in rare instances a papillomatous tumor may be recognized by feeling the papillary outgrowths through the vaginal vault.

The Consistency of the Cyst.—The consistency of the tumor depends upon the nature of its contents, and a dermoid cyst usually conveys a hard or a doughy sensation to the touch. The other varieties, however, feel elastic or tense, although, as a rule, the intracystic pressure is marked and fluctuation cannot be recognized.

Abdominal Stage.—During this period in the development of the cyst it occupies the abdomen and may be readily recognized by inspection and palpation.

The physical signs are elicited by the following means:

Vagino-abdominal and recto-abdominal palpation.
Inspection.
Palpation.
Percussion.
Mensuration.
Auscultation.
Exploratory incision.

Before beginning the examination the bladder and the bowels should be emptied and the clothing arranged so that the entire abdomen may be exposed. The position of the patient changes with the different methods used to elicit the physical signs.

Vagino-abdominal and Recto-abdominal Palpation.—The patient is placed in the dorsal position.

The first step toward making the diagnosis is to examine the pelvic cavity

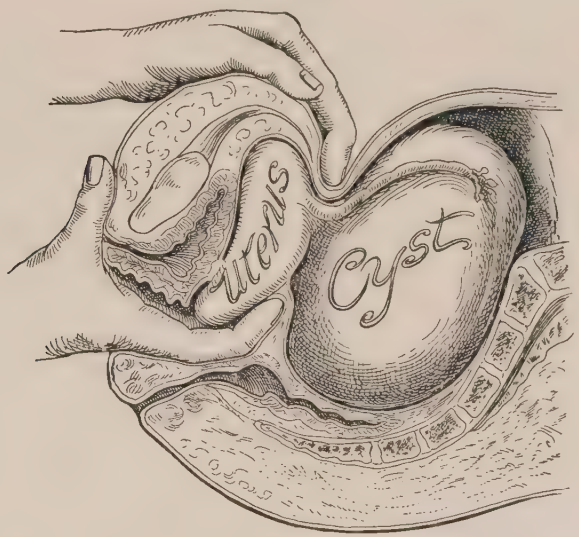


FIG. 490.—METHOD OF SEPARATING THE UTERUS FROM A CYST BY VAGINO-ABDOMINAL TOUCH. Note that the cyst is crowded backward and the uterus grasped by the fingers of the examining hands.

and determine whether or not the tumor arises from one of the organs of the pelvis. Any abdominal cystic tumor of pelvic origin which does not spring from the uterus is with but few exceptions an ovarian or a parovarian cystoma, and the examination must therefore be directed toward excluding uterine neoplasms. If we are able to recognize the uterus by palpation and determine that it is not enlarged or connected with the tumor, we are justified in concluding that the cyst is ovarian in origin.

The position of the uterus varies in cases of ovarian cysts, and it may lie in front of or behind the tumor, or be drawn up almost out of the pelvis by traction, in which case the vagina is elongated and the intravaginal portion of the cervix is more or less obliterated by the tension exerted upon the vaginal vault. Under these circumstances we may be unable to palpate the uterus, and hence the diagnosis must be based upon other physical signs. The lower portion of the cyst is usually felt in the upper part of the pelvic cavity, and when the uterus can

be palpated we should endeavor to prove that they are not connected with each other. This can usually be accomplished unless the uterus and the tumor are closely adherent or are crowded together in such a way that their anatomic outlines are lost. The ovarian origin of the growth may be presumed if a furrow or groove separates the tumor from the uterus; if a pedicle can be felt after pulling the cervix down with bullet forceps; or if the tumor can be moved independently of the uterus. The shape of the tumor can easily be recognized by placing the hand upon the abdomen and pressing in the direction of the pelvis while the fingers of the other hand are in contact with the vaginal portion of the cyst. By means of this manipulation we may feel nodular irregularities or papillary masses upon the pelvic surface of the tumor, and at the same time determine the cystic nature of the growth by eliciting fluctuation.

Inspection.—The patient is placed in the horizontal recumbent position.

By means of inspection we elicit the following diagnostic points:

The shape of the abdomen.
The movements of the abdominal wall.
The appearance of the skin.

The Shape of the Abdomen.—Standing at the side of the patient, we observe the unusual prominence of the abdomen over the situation of the cyst, which can often be indistinctly outlined through the abdominal wall. We also note that the enlargement is more marked between the pubes and the umbilicus than between the umbilicus and the sternum. This difference is at once suggestive of the pelvic origin of the tumor, and therefore important from a diagnostic standpoint. We next observe the surface of the abdomen, which is usually smooth and corresponds to the outlines of the cyst. In those cases, however, in which secondary cysts are present the lobulated condition of the surface of the tumor gives the abdomen an irregular, nodulated appearance. The examiner now stands at the feet of the patient and notes whether or not the abdomen is equally enlarged upon both sides. In cases of ovarian cyst there is always a want of symmetry in this respect, more marked in small than in large tumors, and the distention is invariably greater upon the side of the affected ovary.

The Movements of the Abdomen.—Standing at the side of the patient, the movements of the abdominal wall are carefully watched during natural and forced respiration. If no adhesions exist between the cyst and the parietes, the abdominal wall is seen to move smoothly up and down over the tumor. This is especially noticeable when the surface of the cyst is nodular and the irregularities are seen through the abdominal wall. The act of respiration does not change the position of a tumor which arises from the pelvis, and consequently the cyst itself remains fixed.

The Appearance of the Skin.—Linea albicantes are usually present in cases of large cystic tumors, and they are situated, as a rule, on each side of and below the umbilicus. They have no diagnostic value whatever, and are due to the rupture of the skin of the abdomen from overdistention. Pigmentation, dilated veins, especially near the iliac fossas, and in rare instances edema of the abdominal wall are also observed.

Palpation.—The patient is placed in the horizontal recumbent position with the knees drawn up so as to relax the abdominal muscles and enable the examiner to make deep pressure over the abdomen.

By means of palpation we elicit the following diagnostic points:

The situation and origin of the tumor.
The shape of the tumor.
The consistency of the tumor.
Crepitation.
Local peritonitis.

The Situation and Origin of the Tumor.—By palpating the abdomen in various directions we are able to feel the outlines of the cyst and determine its situation and origin. The lateral margins and the upper border of the growth are recognized without difficulty, and we find that the tumor is practically situated in the middle of the abdominal cavity, slightly more prominent, however, upon one side than the other. The lower border of the cyst cannot be palpated, as the examining hand comes directly in contact with the symphysis pubis before the inferior portion of the growth is reached, which proves that the tumor is pelvic in origin and that it is situated partly within the pelvis. This fact, taken in connection with the previous recognition of the lower part of the cyst by vagino-abdominal palpation and the marked prominence of the abdomen between the umbilicus and the pubes, is strong confirmatory evidence of the origin of the tumor. By means of palpation we are also able to recognize the mobility of the cyst, which can be moved about in various directions according to the length of its pedicle and the character of the adhesions. A very large cyst is practically immovable, on account of its size, but a medium tumor is always more or less movable even when it is adherent to the intestines and to the abdominal parietes.

The Shape of the Tumor.—A small cyst is usually well defined, round in shape, and its surface smooth and regular. A large cyst, on the other hand, is apt to be irregular in outline from the presence of secondary cysts in its walls, which give the tumor a lobulated shape that is readily recognized by palpation. In cases of papillomatous cyst the outgrowths may sometimes be felt upon the surface of the tumor if the abdominal wall is thin and relaxed. Sometimes the outgrowths are felt upon the omentum or upon some neighboring structure as well as upon the surface of the cyst, and, as a rule, in these cases ascites is present as a complication.

The Consistency of the Tumor.—The consistency of an ovarian cyst depends upon its size and character. A small cyst is tense, elastic, and resistant, as the intracystic pressure is too great to allow a wave of fluctuation to be felt, and hence all that can be demonstrated in an overdistended sac is the probable presence of fluid. Even this sign is absent in many cases of dermoid and papillary cysts, as well as in glandular tumors that have thick walls and a large number of loculi. A small dermoid cyst feels either hard or doughy to the examining fingers, and, unlike a glandular tumor, it lacks the tenseness and elasticity that indicate the presence of fluid confined under pressure. After a cyst has attained to a considerable size and it extends beyond the umbilicus fluctuation is readily felt if its contents are not too thick. In other words, as the cyst develops the tenseness and resistance of the sac gradually disappear and eventually fluctuation may be easily demonstrated. The contents of dermoid tumors are semi-solid and consequently fluctuation is absent. The wave of fluctuation is more distinct and longer in duration in unilocular than in multilocular cysts. This is due to the fact that the partition walls of the loculi in the latter cysts interrupt the fluctuation thrill and lessen its length and intensity. Another point of diagnostic value which is characteristic of multilocular cysts is the variations in the length and intensity of the wave of fluctuation over different parts of the tumor. In the case of a unilocular cyst the fluid is contained in a single cavity, and hence the wave must always travel the same distance to reach the opposite side of the cyst wall, and therefore this variation is not present. In a multilocular tumor, on the other hand, the conditions are not the same, and there is often a marked difference in the wave, which is accounted for by the fact that the size of the loculi varies in different portions of the cyst, and that when we elicit fluctuation over a large loculus the thrill is longer and less sharp than over a

small one, because the vibratory wave has a greater distance to travel and because the intracystic pressure is not so great.

Crepitation.—If the hands are placed upon the abdomen and the patient is instructed to take deep inspirations, a grating sensation may be felt as the abdominal wall glides up and down over the cyst. In these cases the crepitus may be due to inflammation of the surface of the cyst, or to the displacement of colloid matter within one of its cavities, and in some instances it may be caused by friction between the abdominal wall and papillary outgrowths.

Local Peritonitis.—The presence of local peritonitis may be inferred when palpation reveals areas of tenderness over the cyst.

Percussion.—The patient is placed in the horizontal recumbent position.

By means of percussion we elicit the following diagnostic points:

The presence of the tumor.

The situation and origin of the tumor.

The shape of the tumor.

The Presence of the Tumor.—The presence of the cyst is revealed by the percussion-note being dull or flat where tympanitic resonance should normally be heard. This is due to the fact that the cyst is situated in the anterior part of the abdomen in close contact with the abdominal wall, and that the intestines are crowded behind, above, and to the sides of the tumor. It should always be borne in mind that when an ovarian cyst contains gas the percussion-note is tympanitic and the tumor might possibly be overlooked on that account. A mistake of this kind, however, is unlikely, as palpation would reveal the presence of the tumor and rectify the error. In some instances a coil of intestine may slip in between the cyst and the abdominal parietes and change the tumor dullness to tympanitic resonance.

The Situation and the Origin of the Tumor.—The presence of the cyst as well as its situation and origin are indicated by dullness on percussion. Directly over the tumor the dullness is absolute, but it gradually shades off into resonance when the lateral and upper margins of the growth are reached. Beginning at the upper part of the tumor, the note is absolutely dull down to the symphysis pubis. A moderately large cyst or one that occupies the lower and middle portion of the abdomen is always surrounded by resonance except at its lower part, and here the dullness which is continuous down to the symphysis pubis indicates the pelvic origin of the growth. Sometimes, however, a cyst with a very long pedicle may rise so completely out of the pelvic cavity into the abdomen that intestinal resonance is elicited immediately above the pubes. In these cases there is a central area of dullness surrounded by an uninterrupted zone or ring of resonance, and a mistake in the diagnosis may easily be made as to the origin of the tumor if the examiner should rely entirely upon the signs elicited by percussion. The situation of the areas of dullness and resonance in ovarian cysts is constant and is not affected by a change in the position of the patient.

In the case of a very large cyst occupying the whole abdominal cavity and encroaching upon the diaphragm the surrounding area or zone of resonance is absent, and there may be dullness not only in the flanks but even over the entire abdomen. Percussion in these cases is of but little diagnostic value, and our chief reliance must therefore be placed upon the results obtained by the vagino-abdominal examination. Sometimes a moderately large tumor may be associated with ascites and the dullness may extend into both flanks. Under these circumstances if the patient is placed upon her side the opposite flank will give a tympanitic note upon percussion and thus demonstrate the presence of free fluid within the abdominal cavity.

The Shape of the Tumor.—The outline of the area of dullness corresponds to the general shape of the cyst.

Mensuration.—The patient is placed in the horizontal recumbent position. The distance between the ensiform cartilage or the umbilicus and the anterior superior spine of the ilium is greater upon the side of the affected ovary. This difference not only indicates the ovary involved, but also the asymmetry of the abdomen which is characteristic of ovarian cysts.

The distance between the ensiform cartilage and the umbilicus is relatively less increased by the tumor than between the umbilicus and the pubes. In other words, the prominence of the lower abdomen is a distinctive feature in tumors of pelvic origin.

Auscultation.—The patient is placed in the horizontal recumbent position with the knees drawn up and the shoulders slightly elevated.

Crepitation or friction sounds may be heard in some cases, but the sign is of no value in the diagnosis of ovarian cysts. Auscultation, however, is important in making a differential diagnosis between an ovarian cyst and pregnancy or where both conditions are associated.

Exploratory Incision.—The treatment of all ovarian tumors is ovariotomy, which should never be delayed because of any uncertainty existing as to the nature of the growth, and consequently an exploratory incision is always indicated.

DIFFERENTIAL DIAGNOSIS.

It may be necessary at times to distinguish an ovarian cyst from one of the following conditions:

Pregnancy.
Phantom tumor.
Fat in the abdominal wall.
Encysted ascites.
Cystic tumor of the kidney.
Parovarian cyst.
Fibrocyst of the uterus.
Ascites.

Pregnancy.—It is always an unfortunate blunder to make a mistake in the diagnosis between an ovarian tumor and pregnancy. In other conditions such an error is of but little importance, as many of these lesions demand laparotomy for their relief, and if an incorrect diagnosis has been made it can easily be rectified at the time of operation with no inconvenience to the patient and with only a slight feeling of chagrin upon the part of the surgeon himself. In the case of pregnancy, however, the situation is entirely different, and an error in judgment may subject a pregnant woman to the unnecessary dangers of an operation, or it may wrongly accuse an unmarried woman of prostitution when she is suffering from an ovarian cyst.

Time is the most important factor in the diagnosis of pregnancy, and the surgeon should never be in a hurry to express a positive opinion when there is the slightest doubt as to the nature of the case. If the objective signs of gestation are absent, they will become apparent in a short time, and no harm will result from the delay even if the case turns out to be an ovarian cyst.

The differential diagnosis is based upon a careful study of the subjective and objective symptoms of pregnancy and the variations and similarities which exist between them and the signs of an ovarian cyst.

The subjective signs of pregnancy should be brought out by taking a thorough history of the patient. Nausea, vomiting, and loss of appetite are common in both conditions, but in pregnancy they are early symptoms and are not associated with bad health and loss of weight, whereas in ovarian cysts they develop late and the woman is usually more or less emaciated. Amenorrhea is the rule in pregnancy and the exception in cases of ovarian cyst. But we must remember that some women menstruate regularly during pregnancy, and that in the later stages of an ovarian cyst amenorrhea may be caused by exhaustion, cachexia, intracystic hemorrhage, and disease of both ovaries. The abdomen, as a rule, enlarges more rapidly in pregnancy than in ovarian cysts, but the distention is not so great. Sometimes, however, in cases of hydramnios the abdomen rapidly becomes enormously distended and the enlarged uterus encroaches upon the diaphragm.

The differential diagnosis, after all, must be based upon the objective signs or symptoms which are elicited by the physical examination, and which are always present and can be demonstrated unless they are overlooked through carelessness. The most important signs are the recognition of the fetal heart-sounds, palpating the fetus, and feeling the fetal movements. If pregnancy is sufficiently advanced, the heart-sounds are usually heard and all question of doubt is at once eliminated. In some cases, however, they are absent, on account of the death or feebleness of the fetus or an excess of amniotic fluid. The recognition of the fetus and the fetal movements are valuable factors in the diagnosis, but unfortunately they are not positive signs of pregnancy, as the examiner may be mistaken in what he feels, and besides they are absent if the fetus is dead or feeble or hydramnios is present. Fluctuation is absent in pregnancy and usually present in an ovarian cyst. It must be borne in mind, however, that if the contents of the cyst are semi-fluid, there can be no wave of fluctuation produced by percussing the tumor. In cases of hydramnios the uterus is distended and fluctuation is distinctly felt over the upper part of the abdomen, whereas in ovarian cysts it is more general and not limited to any one portion of the tumor. Softening of the cervix, ballottement, and Braxton Hicks's sign are very valuable symptoms of pregnancy, and they should always be sought for in making a differential diagnosis. We should also bear in mind the fact that the characteristic changes in the breasts which occur in pregnancy may occasionally be caused by an ovarian tumor.

The coexistence of an ovarian cyst and pregnancy is occasionally observed and the diagnosis may be extremely difficult after the uterus and the cyst occupy the abdominal cavity. Prior to that period, however, there should be but little difficulty in recognizing the tumor and the uterus by recto-abdominal palpation. When, however, they are both abdominal in situation, the abdomen may be so greatly distended that the recognition of two distinct tumors may be impossible. Under these conditions the existence of pregnancy must first be demonstrated by a careful consideration of the objective and subjective symptoms, and then we must endeavor to recognize the cyst as a distinct tumor by means of a vaginal, a rectal, and an abdominal examination.

Phantom Tumor.—There should be no difficulty in distinguishing between a phantom tumor and an ovarian cyst. Vaginal and abdominal palpation fail to demonstrate the presence of a tumor and a tympanitic note is elicited by percussion over the entire abdomen. The administration of an anesthetic or firm pressure with the hands on the abdomen displaces the gas in the intestines, relieves the contraction of the abdominal muscles, and causes the disappearance of the apparent growth.

Fat in the Abdominal Wall.—The administration of an anesthetic is indicated in these cases, as the thickness of the abdominal wall may prevent a

small tumor from being recognized. Resonance is elicited by percussion over the entire abdomen, and the absence of a tumor is demonstrated by vaginal and abdominal palpation. The enlarged and pendulous condition of the abdomen may be accounted for by recognizing the relaxed state of the belly wall and the presence of subcutaneous fat, the amount of which can be estimated by grasping it between the hands.

Encysted Ascites.—Vaginal palpation gives a negative result. The uterus and its appendages are found in their normal position, and the lower portion of the tumor cannot be felt in the upper part of the pelvic cavity, as would be the case in an ovarian cyst. Abdominal palpation reveals a circumscribed tumor having indistinct outlines and more or less flabby walls. It lacks the mobility of an ovarian tumor and no secondary cysts are felt on its surface. Fluctuation is distinct and general, but there are no variations in the length and intensity of the thrill. The percussion-note is dull if the abdomen forms the anterior wall of the cavity, but if the ascitic fluid is surrounded by intestines resonance will be elicited over the entire tumor. The percussion-note is usually resonant between the lower margin of the tumor and the symphysis pubis.

FIG. 491.—DIAGNOSIS OF FAT IN THE ABDOMINAL WALL BY BIMANUAL PALPATION.

Cystic Tumor of the Kidney.—The growth of a cystic tumor of the kidney is usually slower than an ovarian cyst and it develops from above downward. Vaginal touch gives a negative result. Inspection shows that the abdomen is asymmetrically enlarged and that the flank bulges upon the affected side. The peculiar prominence of the lower abdomen which is characteristic of an ovarian cyst is absent, and the greatest distention is higher up upon the affected side. Palpation reveals the fact that the tumor is deeply and firmly located in the kidney region and that it completely fills the lumbar hollow. The lower border of the growth is usually felt just above the pubes and in some cases the colon may be recognized upon the surface of the tumor. The areas of dullness and resonance differ from those of an ovarian cyst. Upon the affected side the flank is absolutely dull, but over the opposite flank the percussion-note is resonant. Tympany is also elicited between the lower margin of the tumor and the pubes and also at its upper border. In other words, the area of dullness is surrounded above, below, and on one side only by a zone of tympany. An ovarian tumor, on the other hand, is surrounded above and on both sides by resonance, but the dullness over the cyst is absolute down to the pubes. The colon, which lies on the

surface of the tumor, may be occasionally outlined by percussion, and sometimes when the small intestines crowd in front of the kidney the area of dullness is absent and resonance is elicited over the greater portion of the growth.

Parovarian Cyst.—It is usually impossible to distinguish between an ovarian and a parovarian cyst prior to the time of operation. A parovarian cyst grows very slowly and may exist for a long time without affecting the patient's health. It is usually unilateral and seldom grows larger than a man's head. It is globular in shape; it has a smooth surface; its walls are very thin; and fluctuation is distinct over the entire tumor. The cyst dips down low into the pelvis and is situated close to the side of the uterus, and, unlike an ovarian tumor, it is fixed and immovable.

Fibrocyst of the Uterus.—The diagnosis is based upon a careful study of the subjective and objective symptoms. In the case of an ovarian cyst the uterus can usually be palpated and its outlines definitely traced, showing that the organ is not enlarged nor the seat of nodular deposits. In the case of a fibrocystic uterus, however, the womb cannot be separated from the tumor, as they are intimately connected and form one mass; the cervix is usually found to be somewhat enlarged, and palpation reveals hard nodules in other parts of the organ.

Ascites.—This condition should never be mistaken for an ovarian cyst or vice versâ, except in cases in which the distention is so great that the physical signs of ascites are absent or difficult to demonstrate. This is also true in those instances in which an ovarian cyst coexists with ascites, as the presence of the tumor may escape detection on account of the large amount of free fluid in the abdominal cavity.

The chief points of differentiation have been arranged as follows:

Ascites.	Ovarian Cyst.
Clinical History.	
Previous history of disease of heart, liver, or kidneys.	No such history.
General health is impaired before the enlargement is noticed.	General health is not affected until the enlargement becomes pronounced.
Enlargement of the abdomen is symmetric from the first.	The enlargement in the beginning is more upon one side than the other.
Vaginal Examination.	
Vault of the vagina bulging.	Vault of the vagina normal or accentuated.
Uterus freely movable.	Uterus usually immovable and displaced by the cyst.
Vagina not lengthened.	Vagina may be elongated.
No change in the cervix.	Cervix may be obliterated by traction of the cyst upon the uterus.
Pelvic cavity free.	The lower part of the cyst may be felt in upper part of the pelvic cavity.
Inspection.	
Enlargement is symmetric in the dorsal or erect position and sitting up.	Enlargement is asymmetric in these positions except in the case of a very large cyst.
In dorsal position abdomen flat with bulging in the loins; not prominent below umbilicus.	In dorsal position abdomen rounded and prominent with no bulging in the loins; marked enlargement below umbilicus.
In erect and sitting positions the lower abdomen is prominent.	No change in shape of abdomen in these positions.
The navel is often bulging and thin.	The navel never bulges.
With the patient upon her side the abdomen is asymmetric.	Very little change in shape of abdomen in this position.

Palpation.

Enlargement offers no resistance when pressure is made upon the abdomen unless the distention is very great.	Distinct resistance is felt when the cyst is palpated.
No tumor is felt in abdomen.	Tumor is distinctly felt and outlined.
The shape of the abdomen can be changed by pressure.	No such change possible.
Fluctuation is general in the abdomen and in the flanks.	Fluctuation limited to the cyst.
Fluctuation is very distinct and the length and intensity of the thrill is constant.	Fluctuation less distinct and the length and intensity of the thrill vary over different parts of the cyst.
Area of fluctuation changes with the position of the patient.	Area of fluctuation is constant.
Aortic pulsation absent.	Aortic pulsation may be present.

Percussion.

The areas of dullness and resonance change with the position of the patient.	No change in the areas of dullness and resonance.
In dorsal position there is a central area of resonance surrounded on both sides and below by dullness. Both flanks are dull.	In dorsal position there is a central area of dullness surrounded above and on both sides by resonance. Both flanks are resonant.
In erect position the upper line of dullness is concave and not so high in the abdomen as in the dorsal position (Fig. 492).	In erect position the upper line of dullness corresponds to the outline of the cyst; it is convex and at the same level as in the dorsal position (Fig. 493).
Lying upon the side the opposite flank is resonant.	The flank is resonant in every position.

Mensuration.

The greatest circumference of the abdomen is at the umbilicus.	The greatest circumference is below the navel.

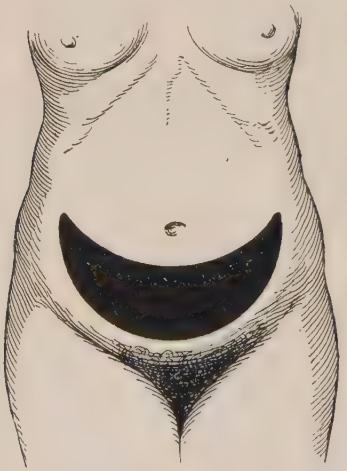


FIG. 492.—Ascites.

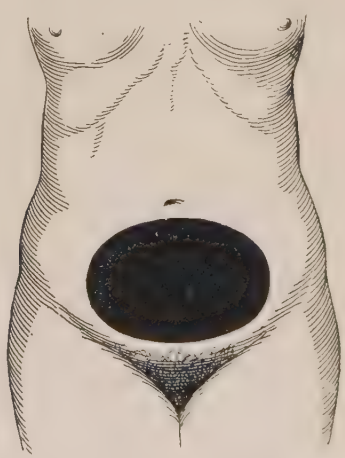


FIG. 493.—Ovarian Cyst.

DIAGNOSIS BETWEEN ASCITES AND AN OVARIAN CYST BY PERCUSSION WITH THE PATIENT IN THE ERECT POSITION. Note that in ascites the upper line of dullness is concave and in ovarian cyst convex.

DEGENERATIONS.

An ovarian cyst may undergo calcareous, fatty, myxomatous, and malignant degenerations.

Malignant degeneration is not an uncommon occurrence and it may develop in any variety of ovarian cyst. It is more likely, however, to occur in papillary cysts than in dermoid and glandular tumors.

PROGNOSIS.

The course and duration of an ovarian cyst depend upon its character and the occurrence of complications or the development of malignant degeneration.

A *glandular cyst* grows more rapidly than the other varieties; it may attain a large size within six or eight months; it develops continuously; there is no limit to its dimensions; and it generally ends fatally, unless removed, within a period of about three years or within two years after the woman's health begins to decline.

A *dermoid cyst* may exist for an indefinite length of time without causing any inconvenience or interfering with the general health of the individual. It grows very slowly; seldom attains a large size; and is particularly prone to attacks of inflammation.

A *papillary cyst* develops less rapidly than a glandular tumor, especially when it is situated between the layers of the broad ligament, in which case it grows very slowly and may take years to attain the size of an infant's head. The duration of life is longer than in cysts of the glandular variety.

A spontaneous cure may exceptionally occur from a rupture followed by the disappearance of the tumor, or from slow torsion of the pedicle causing atrophy, calcification, or fatty degeneration to take place.

The most common causes of death are progressive wasting and emaciation, peritoneal infection, and pulmonary embolism. Many women die from exhaustion which is due to loss of sleep, malnutrition, and dyspnea, which are the direct results of pressure upon the abdominal and thoracic viscera. Kidney complications, obstruction of the bowels, inflammation and suppuration of the cyst, torsion of the pedicle, rupture and hemorrhage, and other accidents contribute their share toward bringing about a fatal ending.

The peritoneum may be infected by the rupture of a papillary cyst, a glandular tumor containing colloid material, or by a dermoid growth. The contents of these cysts are not only liable to cause peritonitis, but they also produce secondary outgrowths which may be scattered throughout the peritoneal cavity.

The occurrence of malignant degeneration may be suspected by a sudden and rapid enlargement of the tumor, profound exhaustion, marked emaciation and cachexia, extensive edema of the legs and abdominal wall, and by induration with fixation of the pelvic organs.

A very guarded prognosis should be given in papillary cysts, and the frequent occurrence of secondary infection must not be overlooked, notwithstanding the fact that in many cases operation has been followed by a cure. The presence of ascites is always unfavorable, and hence the prognosis should be guarded, although the condition does not necessarily denote a fatal ending.

TREATMENT.

The treatment of an ovarian cyst is ovariotomy by the abdominal route. The tumor should be removed at once, as there is less danger in operating upon a small pelvic tumor than a large abdominal growth which has undermined the general health and formed adhesions with adjacent organs. The coexistence of pregnancy does not contraindicate ovariotomy, as it is safer for the woman to have the cyst removed than to run the risk of complications occurring during gestation and labor. (Operative Technic, p. 978.)

CHAPTER XX.

DISEASES OF THE BROAD LIGAMENTS.

PAROVARIAN CYSTS.

These cysts develop from the parovarium, which is the remains of the Wolffian body and situated within the layers of the broad ligament between the outer part of the ovary and the Fallopian tube.

The parovarium consists of a number of tubules which are divided into four parts, as follows: (1) The outer tubules, which are unattached at their distal extremities and known as the tubes of Kobelt; (2) the middle or vertical tubules, which converge and enter the inner part or paroöphoron of the ovary with closed extremities; (3) the inner tubules, which are obliterated and form fine solid cords; and (4) a transverse tube, known as Gärtner's duct, into which the outer and vertical tubules open and which may occasionally be traced to the uterus and thence through the wall of the vagina to the urethra.

The parovarium is homologous with the epididymis and the vasa efferentia in the male, and the duct of Gärtner corresponds to the vas deferens.

The parovarium is without function and is often the seat of cystic changes.

Parovarian cysts are divided into those which develop from (1) Kobelt's tubules and (2) the vertical and transverse tubules.

FIG. 494.—DIAGRAM SHOWING THE PAROVARIUM.

CYSTS OF KOBELT'S TUBULES.

One of the tubes of Kobelt may undergo cystic degeneration, become distended, and form a pedunculated cyst the size of a pea. These cysts have no clinical significance, as they cause no inconvenience or symptoms, and it is impossible to suspect their presence prior to opening the abdomen for some other condition. They are frequently observed, however, at the time of operation, and are often mistaken for a hydatid of Morgagni.

If one of these cysts is met at the time of an operation, it should be emptied by puncture or removed after placing a ligature around its pedicle.

CYSTS OF THE VERTICAL AND TRANSVERSE TUBULES.

These cysts are subdivided into (1) pedunculated and (2) sessile cysts.

Pedunculated Cysts of the Parovarium.

When one of the vertical tubules undergoes cystic degeneration, it becomes distended, and occasionally it may become separated from its connections and form a small pedunculated cyst. These cysts have very thin walls and eventually rupture into the peritoneal cavity. The sac under these circumstances becomes obliterated and a fringe-like tuft remains to mark the situation of the cyst. These cysts have no clinical significance and they cause no inconvenience or symptoms.

If one of these cysts is discovered at the time of an operation, it should be punctured or ligated and removed.

Sessile Cysts of the Parovarium.

Synonym.—They are usually spoken of as the large cysts of the parovarium.

Causes.—These cysts develop from a single vertical tubule or from the transverse tube of the parovarium known as Gärtner's duct. They occur during the child-bearing period of a woman's life, and are seldom, if ever, met before puberty. They are rare compared with the frequency of oöphoritic and paroöphoritic cysts.

Pathology.—The cyst is intraligamentous or extraperitoneal in development and grows between the layers of the broad ligament. As it develops in size it lies in close contact with the uterus, the Fallopian tube, and the ovary. Being situated in the broad ligament it has no pedicle except in very rare instances in which the ligament is elongated or stretched by traction and becomes more or less constricted below the situation of the cyst. The uterus is pushed to the opposite side of the pelvis by the tumor and the Fallopian tube is stretched over its surface. In large cysts the tube may be enormously elongated and measure from fifteen to twenty inches in length. The ovary is usually normal in shape and structure, is attached to the side of the cyst, and in very large tumors it may be so greatly flattened out by pressure that it is difficult to recognize at the time of operation.

Parovarian cysts grow very slowly and may be years in attaining even a medium size. As a rule, they are seldom larger than an infant's head, but occasionally they may become enormous and distend the abdomen. They are almost without exception unilocular in character, although a few cases have been observed in which several distinct loculi were found. Parovarian cysts rarely form adhesions, owing to the fact that they are completely covered by peritoneum and because they are not liable to the complications which cause inflammation in ovarian tumors.

The wall of the cyst is very thin, transparent, and of a greenish hue, and the delicate blood-vessels of the peritoneum are seen upon its surface. The sac of a large cyst may lose its translucency, becoming more or less opaque and of a pearly light blue color. The peritoneum is easily separated from the wall of the cyst unless inflammatory adhesions have occurred, in which case the enucleation becomes very difficult or even impossible. A parovarian cyst is always liable to rupture on account of the thinness of its sac, but the fluid is not irritating to the peritoneum and is readily absorbed. The cyst refills very slowly under these circumstances, and in some cases it becomes obliterated. The contents of the cyst consist of a clear, colorless fluid, which is non-irritating in character and has a specific gravity between 1.002 and 1.008.

In some instances a parovarian cyst may become papillomatous, and the inner surface of the sac is then covered with papillary outgrowths or warts. Its

walls are thicker and more opaque than in the non-papillary variety and the fluid content loses its clear, watery character, becoming cloudy and at times mixed with blood which oozes from the warty outgrowths. These cysts are clinically similar to cysts of the paroöphoron, and the papillary outgrowths may perforate the sac and infect the peritoneal cavity in the same way.

Complications.—The chief complications are:

Inflammation. Axial rotation.
Hemorrhage. Rupture.
Adhesions.

Inflammation seldom occurs in parovarian cysts, and they rarely suppurated in former days when tapping was resorted to for the purpose of effecting a cure. Hemorrhage is a rare accident, except in papillary cysts, on account of the nature of the tumor and the extreme thinness of its wall. Axial rotation due to pregnancy has been observed by Sutton. Rupture is a frequent occurrence and the escaped fluid is readily absorbed by the peritoneum and eliminated by the kidneys. The sac usually refills slowly, and in some instances it may become obliterated. Often in papillary cysts the first symptom of the disease is perforation and subsequent infection of the peritoneum. Adhesions are rarely formed between the tumor and adjacent parts, except in papillary cysts, on account of the fact that the cyst is covered with peritoneum and that it is not liable to inflammation.

Symptoms.—The symptoms of a parovarian cyst are similar in many ways to those of an ovarian cystoma which develops between the folds of the broad ligament.

The symptoms may be conveniently studied under the following headings:

Pressure symptoms.
Menstrual disorders.
Sterility.
General health.
Complications.

Pressure Symptoms.—Symptoms due to pelvic pressure occur early in the course of the disease, as the tumor is fixed in its position and cannot move about or accommodate itself. On the other hand, however, symptoms due to pressure upon the abdominal and thoracic viscera are seldom observed, as these tumors rarely attain a large size.

The chief symptoms are:

Constipation and hemorrhoids.
Irritable bladder.
Urinary disorders.
Digestive disturbances.
Respiratory and cardiac disorders.
Ascites; Edema.
Pelvic and reflex pains.

The effect upon the pelvic structures may be marked and the patient may suffer with constipation, hemorrhoids, irritability of the bladder, hydronephrosis, or albuminuria. The digestive, respiratory, and cardiac disturbances which are so common in large ovarian cystomata are rare in parovarian cysts. Ascites is a frequent occurrence in the papillary variety and pressure upon the iliac veins may result in edema of the legs, the vulva, and the vagina. The presence of the tumor causes a bearing-down or dragging sensation in the pelvis and pain may radiate into the hip, the back, the rectum, or down the thighs. A reflex pain may also be felt in one or both breasts and in the head.

Menstrual Disorders.—Menorrhagia, metrorrhagia, and dysmenorrhea are early and obstinate symptoms in parovarian tumors. Amenorrhea, however,

which is present in the later stages of an ovarian cyst, is not observed in these cases, as the general health of the woman is not profoundly affected by the disease.

Sterility.—Sterility is the rule in tumors of the parovarium on account of the distorted and misplaced condition of the uterus and its appendages.

General Symptoms.—The general health, as a rule, is not impaired and the anemia and the cachexia common to ovarian cysts are not observed in these cases. The patient may become neurasthenic and lose flesh and weight from the severity of the pressure symptoms, but otherwise she is not seriously affected unless the cyst is papillomatous. Enlargement of the mammary glands, pigmentation of the areola, and secretion of colostrum are occasionally associated with these tumors.

Complications.—The complications are the same as those occurring in ovarian cysts and are discussed on page 527.

Diagnosis.—The *history* and the *symptoms* of the patient are often of diagnostic value, and the nature of the tumor may occasionally be inferred by its extremely slow growth and the absence of cachexia, which is so common in ovarian cysts.

For purposes of diagnosis we distinguish the following stages in the growth of a parovarian cyst:

Pelvic stage.
Abdominal stage.

Pelvic Stage.—The bowels and bladder are emptied, the patient placed in the dorsal position upon a table, and the examination made by *vagino-abdominal* and *recto-abdominal palpation.*

The following physical signs are elicited:

The position of the cyst.
The mobility of the cyst.
The relations of the cyst.
The shape of the cyst.
The consistency of the cyst.

The Position of the Cyst.—The tumor is distinctly felt low down in the pelvis and always to one side of the uterus, which it crowds in the opposite direction.

The Mobility of the Cyst.—The cyst is fixed and cannot be displaced by the examining fingers.

The Relations of the Cyst.—The cyst is situated between the layers of the broad ligament and in close contact with the uterus. Between the tumor and the uterus a groove or furrow can be felt, but the connection between them is so intimate that neither the womb nor the cyst can be moved independently of each other, as would be the case with an ovarian growth. The low situation of the cyst in the pelvis is characteristic, and it often bulges the lateral culdesac of the vagina. The tendency of an ovarian cyst as it develops is to ascend into the abdomen, and hence when it becomes abdominal only its inferior border can be felt in the upper part of the pelvis. A parovarian tumor, however, completely occupies the pelvic cavity even after it has attained a large size and encroaches upon the abdominal organs. If we are able to feel a distinct pedicle or to palpate the tube and ovary, the origin of the tumor is, of course, positively determined.

The Shape of the Cyst.—The tumor is round or ovoid in shape and its surface is smooth and regular in outline. If the cyst is papillomatous, we may be able to feel the papillary outgrowths upon the tumor. Ascites is usually present in these cases.

The Consistency of the Cyst.—The tumor is distinctly cystic in

character, no solid or irregular masses are felt, and fluctuation is readily elicited through the vaginal vault.

Abdominal Stage.—The physical signs are elicited by the following means (see ovarian cysts, p. 534): (*a*) Vagino-abdominal and recto-abdominal palpation; (*b*) inspection; (*c*) palpation; (*d*) percussion; (*e*) mensuration; (*f*) auscultation; (*g*) exploratory incision.

Unlike a cyst of the ovary, the tumor always lies to one side of the uterus, the vagina is not elongated, and the intravaginal portion of the cervix is not obliterated. The lower part of the tumor completely occupies the pelvic cavity and bulges the lateral culdesac of the vagina. Pressure downward upon the tumor through the abdominal wall moves the uterus as well as the growth, showing the intimate and close connection between them. A groove or furrow can usually be felt between the tumor and the uterus. No pedicle can be outlined. Bimanual examination reveals a smooth regular surface and fluctuation can be distinctly elicited by vagino-abdominal palpation.

Fluctuation is very distinct over the entire area of the abdomen occupied by the tumor, and, unlike an ovarian cyst, the length and intensity of the wave do not vary over different parts of the cyst.

Differential Diagnosis.—See ovarian cysts, page 539.

Prognosis.—Rupture is sometimes followed by a spontaneous cure. A parovarian cyst grows very slowly and may exist for years without causing any inconvenience or endangering the patient's life. Papillomatous degeneration is dangerous to life by perforation and subsequent infection of the peritoneum.

Treatment.—The cyst should be removed by the abdominal route as soon as it is discovered. The coexistence of pregnancy does not contraindicate surgical interference. (Operative Technic, p. 982.)

VARICOCELE.

Synonym.—Parovarian varicocele.

Causes.—The disease is due to the following causes: Subinvolution and displacements of the uterus; constipation; and exhausting chronic diseases which produce a relaxed condition of all the tissues of the body. The affection is much less frequent than varicocele in the male, of which it is the homologue. This is due to the fact that in man the veins of the testicles are placed perpendicularly, whereas the ovarian veins follow a horizontal course.

Description.—The mass formed by the varicosed veins varies in size from a walnut to that of a hen's egg. The disease occurs more often upon the left side than upon the right, as the left ovarian vein is without a valve and opens at right angles into the renal vein.

Fig. 495.—Varicocele of the Broad Ligament.

Symptoms.—In the majority of cases the woman suffers no inconvenience whatever, as the veins are but slightly dilated and cause but little, if any, local disturbance. When, however, the varicosed veins form a distinct tumor in the broad ligament, they become the source of constant irritation, and the patient consequently suffers with more or less severe pain. The pain is dull, burning or dragging in character, and situated in one or both of the iliac regions, whence it radiates upward into the neighborhood of the kidneys. It is affected by the

position of the patient and by exercise. It is relieved or disappears altogether when the patient is in the recumbent posture, but when she sits up or stands it returns. Its severity is also increased by walking, riding, and all forms of exercise, and in some cases the suffering may be so great when the patient is not in the recumbent position that she becomes a chronic invalid and is confined to her bed.

Diagnosis.—A positive diagnosis is practically impossible prior to the time of operation. Recto-abdominal palpation may reveal a doughy mass in the broad ligament which is smaller when the patient lies down than when she is in the erect position.

The disease must be distinguished from an enlargement of the Fallopian tubes or the ovaries and from tumors of the broad ligaments.

Prognosis.—The disease is not benefited by any form of local or general treatment, and it can only be cured by resorting to surgical measures. There is always danger of the enlarged veins rupturing and causing a dangerous hemorrhage either into the pelvic cavity or between the folds of the broad ligaments.

Treatment.—As a rule, the disease is not even suspected until the abdomen is opened for some other pelvic lesion. When, however, a parovarian varicocele is found to be present, it should always be extirpated, whether it exists alone or is associated with tubo-ovarian disease.

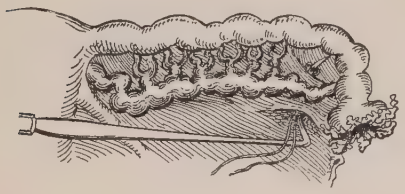


Fig. 496.

Fig. 497.

Reed's Operation for Varicocele of the Broad Ligament.

Fig. 496 shows an interrupted ligature being introduced under the plexus of veins; Fig. 497 shows three ligatures in position and the veins incised between them.

If salpingo-oöphorectomy is performed, the varicocele is necessarily included in the ligature that is passed through the broad ligament before cutting away the tube and ovary, and hence the dilated veins are removed at the same time.

If, however, the varicocele exists alone, it can be readily removed without sacrificing the tube and ovary by Reed's operation, which consists in ligating the pampiniform plexus in sections and incising the veins between the ligatures.

SOLID TUMORS.

The following tumors have been found in the broad ligaments: Fibroma, lipoma, carcinoma, and sarcoma.

Fibromata arise in the unstriped muscle tissue between the folds of the broad ligament and develop either downward, encroaching upon the vagina, or upward, carrying the anterior surface of the broad ligament into the abdominal cavity. These tumors vary in size, and, as a rule, they seldom grow very large. Cases have been occasionally observed, however, in which the tumor attained large proportions, and either extended upward as high as the umbilicus or developed downward displacing the vagina and appearing at the vulvar orifice.

Lipomata are very rarely seen in the broad ligament.

Carcinoma and **Sarcoma** of the broad ligament are secondary to malignant disease in the uterus, the ovary, or the peritoneum.

The nature of a solid tumor of the broad ligament cannot be determined prior to opening the abdomen. As soon, therefore, as such a growth is discovered, laparotomy should be performed and the tumor extirpated.

CHAPTER XXI.

TUMORS OF THE OVARIAN LIGAMENTS.

The following tumors have been found in the ovarian ligaments: Fibroma, carcinoma, and sarcoma.

Fibromata are very rare and seldom attain a size larger than a hen's egg.

Tumors of the ovarian ligament cannot be distinguished from neoplasms of the ovary prior to opening the abdomen.

The **treatment** is abdominal section followed by the removal of the tumor.

CHAPTER XXII.

TUMORS OF THE ROUND LIGAMENTS.

The following tumors have been found in the round ligaments: Fibroma, carcinoma, and sarcoma.

Fibromata.—These tumors are more common in women who have borne children than in nulliparæ, and they are more frequent in the right than in the left round ligament. They may present themselves either as a fibroma, a fibromyoma, a myxofibroma, a fibrosarcoma, or a lymphangiectatic fibroma. They may be *extraperitoneal* in development and occupy the inguinal canal or the labium majus, and they may also be *intraperitoneal* and arise from the pelvic portion of the round ligament which lies between the uterus and the internal abdominal ring. While these neoplasms, as a rule, develop slowly, they are often stimulated under the influence of pregnancy and rapidly increase in size, and in very exceptional cases they become larger at each menstrual period. A fibroma of the round ligament is usually hard in consistency, generally pedunculated, although occasionally it may be sessile, and its surface is smooth or only slightly irregular. It varies in size and is not tender upon pressure.

Symptoms.—The symptoms depend upon the size of the tumor, and a small growth may cause no inconvenience whatever, but a large one will necessarily produce painful pressure symptoms.

Diagnosis.—The presence of an *intraperitoneal* fibroma is determined by vagino-abdominal palpation. The tumor is felt high up in the anterior part of the pelvis in the neighborhood of the internal abdominal ring or between it and the horn of the uterus. The diagnosis is based upon the history of the case, the situation of the tumor, and the absence of all pelvic symptoms except those due to pressure.

Extraperitoneal fibromata of the round ligament must be distinguished from the following lesions: Omental or ovarian hernia, a cyst of the gland of Bartholin, and enlarged inguinal lymphatic glands. When the tumor occupies the inguinal canal or the labium majus, we find that there is no impulse upon coughing or

straining and the enlargement cannot be reduced by taxis except it is very small or is situated high up in the canal.

Treatment.—The treatment is extirpation as soon as the tumor is discovered.

An intraperitoneal growth must be removed by the abdominal route. If the tumor is pedunculated, it is readily excised after tying a silk ligature around its pedicle. A sessile tumor should be removed by resecting the round ligament and suturing the cut ends together in order to restore its function. If the fibroma is situated near the internal inguinal ring, it should be removed by resection and the uterine portion of the ligament sutured close to the opening of the inguinal canal.

A fibroma situated in the labium majus should be extirpated and the wound closed with deep sutures. If the tumor occupies the inguinal canal, it should likewise be removed; and if the wound is small, it may be closed with deep sutures, but if, on account of the length of the incision, there is any danger of a rupture occurring, the radical operation for hernia should be performed at once.

CHAPTER XXIII.

SUPPURATION OF THE PELVIC CONNECTIVE TISSUE.

Causes.—In discussing suppurative conditions of the pelvic connective tissue I shall consider only those purulent accumulations that are the result of primary cellulitis and exclude secondary infections which result from disease of the Fallopian tubes and ovaries.

Primary cellulitis is an extremely rare occurrence, and although in former times nearly all pelvic inflammatory conditions were attributed to that cause, yet we now know that such is not the case, and that with but few exceptions the disease is secondary to a tubal or an ovarian infection.

Exclusive of tubo-ovarian disease, pelvic cellulitis is usually puerperal in origin and is due to various injuries that subsequently become infected. Thus, the cellular tissue of the pelvis may become involved in cases of laceration of the perineum or the cervix; in tears of the lateral culdesac of the vagina which extend into or open up the base of the broad ligaments; and in septic endometritis when the infection is carried by the lymphatic vessels and veins or when it passes directly through the wall of the uterus.

In non-puerperal cases the disease may result from a suppurating hematoma of the broad ligament or a pelvic hematocele; from infection following a vaginal, a uterine, or an intrapelvic operation, from an ulceration caused by an ill-fitting pessary; and also from the passage of pathogenic germs from the bladder, the rectum, the intestines, or the vermiform appendix.

Pathology.—Pelvic cellulitis may end in resolution; become chronic; or result in the formation of pus. Purulent collections may be situated in any portion of the cellular tissue of the pelvis, and while they are more common in the broad ligaments than in other structures, yet they are occasionally found in the connective tissue in front of or behind the uterus. The pus usually burrows along the route of least resistance and finally escapes through an adventitious opening into the bladder, the vagina, the rectum, the intestine, or the peritoneum. In some cases it may burrow between the vagina and the rectum and appear in the lower part of the labium majus or the perineum; in others it may pass through the saphenous, sacrosciatic, or obturator opening; and, finally, it may escape

at the umbilicus or through the skin above, but seldom below, Poupart's ligament. As a rule, in these cases the abscess breaks into the vagina, whereas purulent accumulations in the connective tissue that are secondary to tubal or ovarian disease rupture into the intestine or the bladder. Peritonitis seldom occurs, as the abscess rarely breaks into the peritoneal cavity.

If one of these abscesses ruptures, the sac usually becomes obliterated, if the drainage is good, and a spontaneous cure results.

Symptoms.—The symptoms are in no way characteristic of the disease and are practically the same as those of tubal or ovarian suppuration.

The patient complains of severe pain in the lower abdomen and in the pelvis, which often radiates down the thighs; there is a rise in temperature; the pulse is rapid and weak; and there is loss of appetite, great prostration, and often repeated chills. The rectum and the bladder may become irritable and cause painful urination and defecation. The abdomen is not distended as in peritonitis and there is no tendency to nausea or vomiting.

Diagnosis.—It is practically impossible to distinguish between a case of suppurative cellulitis due to tubo-ovarian disease and one that is due to other causes. The physical signs of pelvic suppuration are determined by *recto-abdominal* and *vagino-abdominal palpation*.

As a rule, the patient complains of pelvic pain and tenderness during the examination. The mass formed by the purulent accumulation is irregular in shape, more or less diffused, and immovably fixed in the pelvis. It may be soft and boggy to the touch or it may be so completely surrounded by inflammatory exudate that it conveys a hard resisting sensation to the examining finger. As a rule, fluctuation cannot be elicited; but in large abscesses this sign is easily determined and the examiner has but little, if any, difficulty in recognizing the presence of pus.

The abscess may be situated in the broad ligament or behind or in front of the uterus. If the connective tissue of the broad ligament is involved, the tumor pushes the uterus toward the opposite side of the pelvis and bulges into the corresponding lateral culdesac of the vagina. An abscess behind or in front of the uterus distends the posterior or anterior vaginal fornix.

Prognosis.—The prognosis in cases of purulent cellulitis not due to tubo-ovarian disease, while necessarily grave, depends to a large extent upon the cause of the infection and the promptness of surgical interference.

If an abscess ruptures into the abdominal cavity the peritoneum becomes rapidly inflamed, and a fatal result usually follows. On the other hand, however, if the pus escapes through the skin or into one of the hollow viscera, the sac usually becomes obliterated and a spontaneous cure results. Death in some cases may be caused by general sepsis.

Treatment.—The treatment of suppurative pelvic cellulitis is based upon the general surgical principle which teaches us to evacuate an abscess without delay and establish free drainage. In these cases, however, the question at once presents itself as to the route that should be selected to reach the pus. Shall we operate through the vagina or should laparotomy be performed? If we are able to exclude tubo-ovarian disease as the cause of the abscess, the question would be easily answered and the vaginal route selected as being safer and offering better advantages for irrigation and drainage than abdominal section. But unfortunately, as stated above, it is practically impossible to determine the nature of the case prior to opening the abdomen; and as primary cellulitis is a very rare condition, the chances are all in favor of an intraperitoneal source of infection, which would not be benefited by a vaginal section, as there is no

possible way of draining the numerous pockets of pus that exist and which are so characteristic, in cases of purulent inflammation of the tubes and ovaries.

In view, therefore, of the absolute uncertainty of the diagnosis, laparotomy should first be performed, and if the uterine appendages are found to be normal, the abdomen is closed at once and the abscess opened and drained through the vagina.

CHAPTER XXIV.

ECHINOCOCCUS DISEASE OF THE PELVIS.

Causes.—Hydatid disease is more frequent in the female than in the male; Jon Finsen, of Iceland, who personally observed 245 cases, found that over 70 per cent. occurred in women. The primary source of the disease is derived from dogs who are affected with *tenia echinococcus*. The eggs or larvæ of the tapeworm enter the human body through the mouth or, in the case of a woman, also by way of the vagina. If the larvæ enter the mouth of an individual, they pass directly into the intestine, and eventually either burrow through its wall or gain access to the portal vein; they are then distributed to various parts of the body and finally form echinococcus or hydatid cysts. The disease is endemic in Iceland, where men, women, and dogs live together in closely confined quarters. It is also common in Australia, Mecklenburg, Silesia, and in other parts of the world. The affection is rare in America and comparatively infrequent in Asia and Africa.

Description.—Hydatid cysts of the pelvis are most frequently situated in the connective tissue near the rectum, but they may also be met in the anterior part of the pelvic cavity, and occasionally they have been observed in the uterus or its appendages, in the broad ligaments, and in the bones. They may develop upward and form an abdominal tumor, or they may gradually burrow downward and pass through one of the pelvic foramina or follow the connective tissue between the rectum and the vagina.

The hydatid fluid contains about 98 per cent. of water; it is limpid and colorless; and has a neutral reaction and a specific gravity between 1.005 and 1.012. The echinococci may die from want of nourishment, from the pressure of surrounding structures upon the cyst, and from suppuration occurring in the tumor. If the cyst becomes infected, the fluid content becomes purulent in character and thick or putty-like in consistency. In some cases the cyst may contain a bloody fluid and in others its contents may become calcified. Occasionally the cyst may become infected on account of its close connection with the rectum or intestine, and the resulting suppuration converts it into a pelvic abscess. Sometimes the cyst may rupture and discharge its contents into the rectum, the bladder, or the vagina, and in rare instances into the pelvic cavity or the uterus.

Symptoms.—Echinococcus cysts may exist for a long time in the pelvis without interfering with the patient's general health or causing any local symptoms. After the cysts have attained a large size, however, they encroach upon the pelvic structures and interfere with the function of the bladder, the kidneys, and the rectum, and cause edema of the lower extremities as well as neuralgia of the sciatic nerve. The general health also begins to suffer and there is gradual progressive loss of strength and weight.

Fever is seldom present during the course of the disease unless the cyst becomes infected, in which case the usual symptoms of pelvic suppuration manifest themselves and the patient suffers with rigors, fever, sweating, and rapid loss of flesh.

Diagnosis.—The diagnosis is difficult and often impossible, and can only be made by exclusion or detecting certain characteristic physical signs, which are more marked if the tumor extends into the abdominal cavity than when it is confined to the pelvis. The prevalence of the disease in certain countries and localities should be borne in mind as well as the absence, as a rule, of fever and pain. The fact that the general health is not impaired and that the patient is not emaciated are in favor of the disease being hydatid. If the cyst ruptures into one of the hollow viscera and the characteristic *hooklets* are discovered in the discharged contents, the diagnosis becomes positive.

The coexistence of a hydatid cyst in the liver or some other abdominal organ has an important bearing upon the diagnosis of a pelvic tumor having some of the subjective and objective characteristics of echinococcus disease.

Physical Signs.—The physical signs of a hydatid cyst are more or less characteristic, but unfortunately they are not so distinctive when the disease is confined to the pelvis.

If the disease is limited to the pelvic cavity, recto-abdominal and vagino-abdominal palpation reveals one or more cystic tumors, situated usually in the posterior part of the pelvis, behind the cervix and near the rectum. The tumors are round and elastic; their walls are smooth and tense; they are somewhat movable; and they are not tender upon pressure unless inflamed. Careful palpation reveals the fact that the uterus and its appendages are not connected with the tumor and the cervix is more or less covered over by the bulging and elastic vaginal fornices. The *hydatid thrill* or *fremitus* cannot be detected when the disease is confined to the pelvic cavity.

When the disease extends into the abdomen and forms a palpable tumor above the symphysis, certain physical signs are obtainable, in addition to those just described, which are characteristic and of great importance in making the diagnosis. The situation and the origin of the growth, as in the case of an ovarian cyst, are determined by recto-abdominal and vagino-abdominal touch, by abdominal palpation, and by percussion. The bimanual examination reveals conditions within the pelvis similar to those described above in discussing the physical signs of a pelvic hydatid cyst, and in addition we are able to detect the connection between the abdominal tumor and the masses in the pelvis. Fluctuation is very distinct in echinococcus cysts, and we may at times be able to feel the hydatid thrill or fremitus which when present is a pathognomonic sign. The latter phenomenon is elicited by pressing the palm of the hand firmly against the tumor and making light percussion upon the opposite side; under these circumstances a trembling impulse or thrill is felt over the cyst. According to some authorities, auscultation gives "a short, sharp booming sound when the tumor is percussed, that may be likened to one produced by striking a membrane stretched over a metallic frame."

Prognosis.—The prognosis is always grave. Spontaneous cures have been observed from time to time which were due to calcification of the sac, to the death of the echinococcus, and to rupture of the cyst. The disease may exist for several years without causing local or general symptoms. Suppuration is a serious complication and one that is liable to occur in hydatid disease of the pelvis on account of the close relation existing between the cyst and the intestinal tract. Death may occur in some instances from the coexistence of a hydatid cyst in the liver or some other organ.

Treatment.—The treatment of hydatid disease is surgical.

If the tumor extends into the abdomen, laparotomy should be performed and the cyst enucleated; or if this is impossible, the sac should be stitched to the abdominal incision and packed with iodoform gauze after removing its contents.

If the cyst is situated in the pelvic cavity, an exploratory abdominal incision is indicated to make the diagnosis. Should the tumor prove to be a hydatid cyst, the abdomen must be closed at once, and an incision is then made through the vaginal fornix into the growth. The contents of the cyst are then removed and the sac packed with iodoform gauze.

CHAPTER XXV.

ECTOPIC GESTATION.

Definition.—By the term "*ectopic*" or "*extrauterine*" gestation is meant a pregnancy that develops outside of the uterus. The ovum may be fertilized in the Fallopian tube, but unless it is arrested in that situation it eventually passes into the uterine cavity and a normal pregnancy results. It is therefore obviously incorrect to speak of an ectopic pregnancy as originating outside of the uterus unless it is understood that the ovum is permanently arrested in that situation.

Varieties.—An ectopic gestation may be **Primary** or **Secondary.** The former is the seat of the original implantation of the fertilized ovum and the latter is the new situation which is assumed by the embryo or fetus when it is disturbed by the process of development or rupture.

A primary ectopic gestation is subdivided into a **Tubal Pregnancy** when the fertilized ovum is implanted in the tube, and into an **Ovarian Pregnancy** when it develops within the ovary.

From a practical standpoint we may, however, regard all cases of ectopic gestation as tubal in origin, and therefore this variety alone will be referred to in the subsequent consideration of the subject.

An *ovarian pregnancy* is an extremely rare occurrence, and the possibility of the ovum being fertilized within the Graafian follicle has been for a long time denied. The views of the profession, however, upon this subject have changed within a comparatively recent period, and the occurrence of an ovarian pregnancy is now admitted.

It is impossible for an abdominal pregnancy to occur primarily, even admitting that the ovum may become fertilized in the peritoneal cavity, for the reason that the product of conception would at once be destroyed and absorbed by the peritoneum.

TUBAL GESTATION.

Causes.—Tubal pregnancy is a comparatively common occurrence, as shown by Formad, who found 35 ectopic gestations in 3500 general autopsies. The affection is apt to occur after a long period of sterility, or it may sometimes happen within a few weeks or months after confinement, and, finally, it may occasionally coexist with a normal pregnancy. The accident may occur not only in multiparous but in nulliparous women as well, and no period in a woman's child-bearing life is exempt. A number of instances of a repeated tubal pregnancy

have been observed, and we should therefore always bear in mind the possibility of the accident occurring in the other tube at some future period.

Ectopic gestation is probably due to some mechanic cause which obstructs the lumen of the tube and prevents the fertilized ovum reaching the uterine cavity.

The causes may be divided into:

The intratubal causes.

The extratubal causes.

The Intratubal Causes.—These causes are subdivided into:

Chronic salpingitis. Congenital malformations.

Neoplasms. Displacements.

Chronic Salpingitis.—The lesions due to chronic inflammation of the tubes are the most frequent cause of ectopic gestation. The hypertrophy of the tube which is usually associated with chronic salpingitis interferes with its natural peristaltic movements and constricts its lumen, and hence the fertilized ovum is likely to be permanently arrested before reaching the uterine cavity. In some cases the ovum may be arrested by an inflammatory stricture, and in others, according to Tait, the destruction of the ciliated epithelium with the consequent absence of the normal tubal current toward the uterus prevents the product of conception from passing through the tube. The latter theory is now denied by most authorities, and Kelly has demonstrated that a "careful examination of inflamed tubes shows that the cilia are rarely destroyed, even in well-marked cases of pyosalpinx, and are perfectly preserved in cases of catarrhal salpingitis."

The ovum from the ovary of one side may pass across the pelvis and enter the opposite tube. This is known as *transmigration of the ovum*, and it explains those cases of tubal pregnancy which occur on the opposite side to the ovary containing a recent corpus luteum. According to Kelly, "Dr. Williams has been able to demonstrate it in five out of thirty cases, of which he had accurate pathologic records. In all of them the fimbriated extremity of one tube was completely occluded by old inflammatory processes, or the tube was converted into a hydrosalpinx, while the other tube was the seat of the pregnancy, and presented a patent fimbriated extremity. In each case the ovary on the pregnant side presented no evidence of a corpus luteum, while the ovary corresponding to the occluded tube contained a typical corpus luteum of pregnancy."

Neoplasms.—Tubal neoplasms are an infrequent cause of ectopic gestation. They cause an obstruction in the lumen of the tube and permanently arrest the passage of the fertilized ovum at that point.

Congenital Malformations.—The following malformations favor the occurrence of tubal pregnancy: Diverticulums, accessory ostia, and the persistence of a fetal type which results in a long, slender, tortuous tube.

Displacements.—A displacement of the tube cannot cause an ectopic pregnancy unless it produces torsion or kinking, in which case the lumen is constricted or obliterated and the ovum cannot pass through into the uterus.

The Extratubal Causes.—These causes are subdivided into:

Adhesions.

Tumors.

Adhesions.—Pelvic adhesions are not an uncommon cause of ectopic gestation. They may bind down the tube in such a position that its peristaltic movements are impeded or they may cause torsion and kinking, and in some instances the lumen is constricted by a tough band of inflammatory lymph.

Tumors.—The lumen of the tube may be distorted and compressed from the pressure exerted upon it by a neoplasm of the ovary, the parovarium, or the uterus, and the fertilized ovum prevented from reaching the uterine cavity.

Classification.—Gestation may take place in any part of the tube from the fimbriated extremity to the uterus. Tubal pregnancies are classified according to the original seat of implantation of the impregnated ovum as follows:

Ampullar pregnancy.
Isthmic pregnancy.
Interstitial pregnancy.

Ampullar Pregnancy.—This is the most frequent form of tubal pregnancy and the ovum is attached to the ampullar or outer portion of the tube. A *tubo-ovarian* pregnancy, which is a subdivision of the ampullar, occurs when the fimbriated extremity is glued down to the ovary and the latter organ forms a part of the gestation sac.

Isthmic Pregnancy.—This variety is not nearly so common as ampullar pregnancy. The fertilized ovum is attached to the free portion of the tube at any point between the ampulla and the uterus.

Interstitial Pregnancy.—This is the rarest form of tubal pregnancy. The ovum is lodged in that part of the tube which penetrates the wall of the uterus.

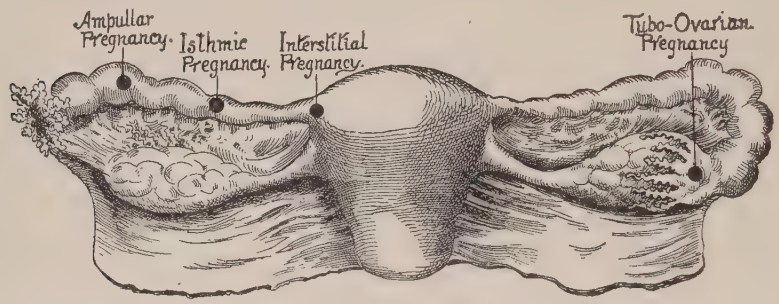


FIG. 498.—CLASSIFICATION OF ECTOPIC GESTATION.
Showing the sites of implantation of the ovum.

Course of the Gestation.—In the beginning the tube becomes hypertrophied, swollen, and turgid, and its vascularity is greatly increased. The abdominal opening gradually becomes contracted, until finally by the eighth week it is entirely closed in a manner similar to that already described in discussing the closure of the ostium in cases of salpingitis (p. 489). As the ovum develops the tube becomes thin and distended and its walls are weakened by the penetration of the chorionic villi.

The pregnancy may end in one of the following ways:

Tubal abortion.
Rupture of the tube.
Death of the product of conception before tubal rupture.
Development of the fetus to full term without tubal rupture.

Tubal Abortion.—By tubal abortion we mean the partial or complete expulsion of the product of conception through the abdominal end of the tube into the peritoneal cavity. When this accident occurs, it must necessarily take place before the eighth week, because after that time the abdominal ostium is completely closed and the ovum cannot escape from the tube except by a rupture in its walls. An abortion is most liable to occur in the ampullar form of tubal

pregnancy; it very rarely takes place in the isthmic; and never happens in the interstitial variety.

The expulsion of the ovum is usually accompanied by hemorrhage. In some cases it may be so profuse that the patient rapidly perishes; in others the amount of blood lost is not sufficient to cause marked disturbances; and, finally, the product of conception may be expelled into the peritoneal cavity without any bleeding whatever. If the ovum is only partially expelled from the tube it is apt to cause repeated and profuse hemorrhages, and under these conditions the patient may quickly bleed to death. As a rule, in addition to the intraperitoneal hemorrhage, blood also accumulates in the tube, and if the fimbriated extremity becomes occluded a hematosalpinx is likely to result.

The fetus always dies after a tubal abortion, and the results, so far as the mother is concerned, vary in individual cases. Sometimes the bleeding stops and the embryo and blood are absorbed, and recovery takes place without any unfavorable symptoms; in others the patient may rapidly perish from shock and hemorrhage; and, finally, the pelvic hematocele may become infected and a fatal peritonitis result. Occasionally the hematocele is walled off by adhesions, and if it subsequently becomes infected a pelvic abscess results which may rupture and discharge its contents into the rectum, the intestine, the bladder, or the vagina.

FIG. 499.—AMPULLAR PREGNANCY.

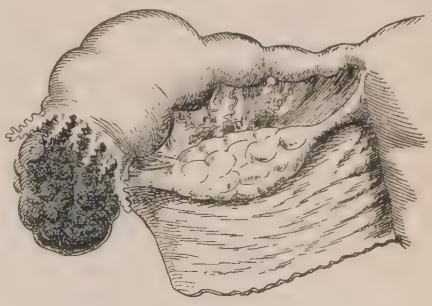


FIG. 500.—TUBAL ABORTION.

Tubal abortions are more common than were formerly supposed, and we now know that many of the cases of pelvic hematocele which were thought to be due to a hemorrhage from a non-impregnated tube were in reality caused by the expulsion of a fertilized ovum through the abdominal opening of the oviduct.

Rupture of the Tube.—This is the most common termination of the pregnancy, and it is directly due to overdistention of the tube by the growing ovum and to weakening of the tubal walls by the penetration of the villi. The external causes of rupture, which are purely traumatic, are vaginal examinations, a misstep, straining at stool, violent exercise, lifting heavy objects, and sexual intercourse.

The rupture may take place in one of three directions (Fig. 501):

Into the abdominal cavity.
Between the folds of the broad ligament.
Into the uterus.

Into the Abdominal Cavity.—Rupture into the abdominal cavity may occur in all three varieties of tubal pregnancy,—*ampullar*, *isthmic*, and *interstitial*,—and it is usually followed by death within a few hours unless the bleeding vessels are controlled by an immediate laparotomy. The hemorrhage,

as a rule, is more severe and more rapidly fatal in an interstitial pregnancy than in the other varieties on account of the greater thickness and vascularity of the uterine end of the tube.

The rupture may take place suddenly and a large rent may be made in the tube through which the ovum and its membranes are expelled and the blood

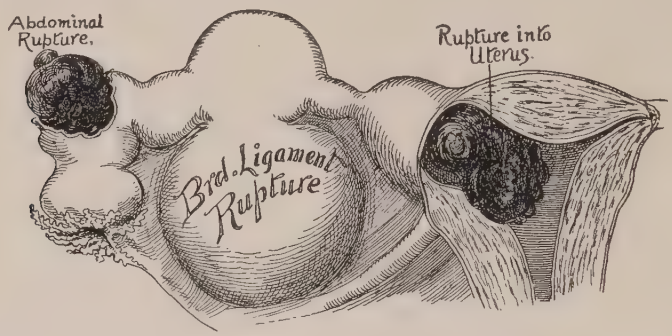


FIG. 501.—RUPTURE OF A TUBAL PREGNANCY (page 559).
Showing the three directions in which a rupture may take place.

rapidly escapes. Sometimes, however, the tubal walls give way gradually, and the bleeding is continuous but not profuse, or it may be checked altogether by the ovum blocking up the opening.

As stated above, the patient, as a rule, dies within a few hours after rupture unless an immediate laparotomy is performed; but this does not always happen, as she may rally after the first hemorrhage and ultimately perish from a subsequent attack; or the bleeding may stop permanently and a spontaneous recovery take place after the blood and the ovum have been absorbed by the peritoneum. Sometimes the hematocele becomes infected and death results from peritonitis, or if it is walled off by adhesions it may rupture into one of the hollow viscera.

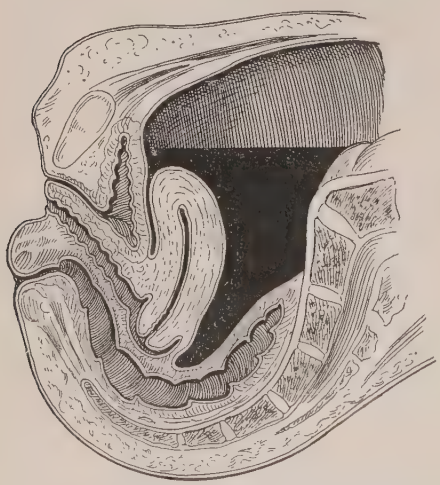


FIG. 502.—PELVIC HEMATOCELE RESULTING FROM ABDOMINAL RUPTURE OF A TUBAL PREGNANCY.

The fetus, as a rule, dies at the time of the first hemorrhage. In very rare cases, however, after the fetus has escaped into the peritoneal cavity it may continue to develop provided its membranes are not torn and its placental attachment to the tube is not destroyed. The old theory that the fetus could attach itself to the peritoneum and continue to grow is no longer taught, and we now know that the fetus must perish at once if its original attachment is destroyed.

Between the Folds of the Broad Ligament.—Rupture of the tube downward between the layers of the broad ligament may occur in isthmic or in ampullar pregnancy, but it is not so likely to happen in the interstitial variety.

The hemorrhage, as a rule, is not profuse, as the blood is poured out into a confined space and the bleeding ceases when this is filled. The broad ligament hematoma which is thus formed may be absorbed in time along with the embryo, or it may become infected and produce a pelvic abscess.

The fetus, as a rule, dies when the rupture occurs, but in some instances it may continue to develop and go to term. If the embryo lives, the intraligamentous space gradually enlarges to accommodate the growing ovum and the pelvic organs are displaced or pushed aside. In some instances the broad ligament is unable to stand the strain put upon it by the increasing distention, and a secondary rupture occurs and the fetus is expelled into the peritoneal cavity. Under these conditions the pregnancy may continue and go to term provided the expulsion of the fetus is gradual, the amount of hemorrhage slight, and the placenta retains its attachments. As a rule, "*full-term ectopic fetuses are extraperitoneal.*"

Into the Uterus.—The gradual expulsion of the ovum into the uterine cavity may occur in interstitial pregnancy, and if the placental attachment of the fetus is not destroyed the gestation may continue to term and the child be delivered by the natural passages.

Period of Rupture.—In cases of tubal pregnancy the rupture may take place at any time.

Fig. 503.—Hematoma of the Broad Ligament from a Ruptured Tubal Pregnancy.

In *isthmic* and *ampullar* gestations it may occur between the fourth and the twelfth week; in the majority of cases, however, the tube ruptures about the end of the second month.

In *interstitial* gestations it may occur between the fourth and the twentieth week; usually, however, at the end of the fourth month.

Death of the Product of Conception before Tubal Rupture.—It may occasionally happen that the fetus dies early in the course of pregnancy from a hemorrhage into its membranes, and the gestation sac and its contents are then converted into an organized mass which is called a *tubal mole* from its resemblance to a similar uterine condition. The size of the mole depends upon the development of the fetus at the time of its death and the amount of intratubal bleeding. A tubal mole that does not become infected may be retained in the tube for a long time without causing any other symptoms than those dependent upon the presence of a mass in the pelvis. The most common cause of hematosalpinx is the death of the embryo from intratubal hemorrhage prior to rupture.

Development of the Fetus to Full Term without Tubal Rupture.—In very rare instances the fetus may develop within the tube and die after the gestation has reached full term.

History of the Ovum.—The changes which occur in the ovum in cases of tubal pregnancy depend upon various conditions and circumstances.

The **early death** of the fetus, occurring before the tube ruptures, results in a tubal mole or in suppuration. After tubal rupture, if the ovum is expelled into the peritoneal cavity, the fetus usually dies at once, and it may either be absorbed or undergo suppurative changes; in rare instances it may continue to develop and even go to term. If the rupture occurs between the folds of the broad ligament, the fetus, as a rule, dies; but the absorption is apt to be very slow, and hence a mole may be formed. Again, suppuration may take place or the pregnancy may continue and go to term, or, finally, a secondary rupture may occur into the peritoneal cavity, when the embryo generally dies, but in rare cases it may continue to develop.

The **late death** of the fetus results in certain changes which are peculiar and interesting. These changes take place either before or after full term and when the fetus occupies either the tube, the peritoneal cavity, or the broad ligament.

Thus, the fetus may become calcified and form a lithopedion; it may be changed into adipocere; it may become mummified; or, finally, nothing may remain but the skeleton. After undergoing one of these changes the fetus usually becomes encapsulated and remains quiescent in the mother's body for years, or the gestation sac may rupture into one of the hollow viscera and its contents may escape into the intestine, the rectum, the bladder, the vagina, or the peritoneal cavity.

Sometimes suppuration takes place after the death of the fetus and a pelvic abscess forms which may break into a hollow viscus or into the abdominal cavity.

The Physical Development of the Fetus.—In the majority of cases the fetus is poorly nourished, ill developed, undersized, and often deformed, although at times it may be physically perfect and apparently healthy. Hydrocephalus, spina bifida, club-foot, and visceral displacements are common.

If the pregnancy goes to term, the child usually dies at the time of its removal, and even if it survives the operation, death usually occurs within a few days or weeks.

Changes in the Uterus.—During the development of a tubal gestation the uterus is hypertrophied, the cervix is softened, the os becomes patulous, and the decidua vera is formed, as in the case of a normal pregnancy. The shape of the uterus is not so round or ovoidal as it is in a uterine pregnancy, because the greatest increase takes place in the length of the organ. The uterus ceases to enlarge when the ovum dies, but if the pregnancy goes to term, it continues to develop, and may eventually reach the size of the fourth month of a normal gestation.

Sutton, quoting Parry, says: "The decidua is rarely retained until the completion of gestation, and thrown off during false labor. More frequently, if the patient goes to term, it is discharged during the early periods of pregnancy in small fragments, and without producing pain; or else it is expelled *en masse* with symptoms of miscarriage."

Symptoms.—The symptoms of tubal pregnancy are classified into those which are present:

Before primary rupture or abortion;
At the time of rupture or abortion;
During the latter half of gestation.

Before Primary Rupture or Abortion.—In the vast majority of cases a tubal gestation terminates by rupture within the first three months, and hence from a practical standpoint this period is of more interest to the general practitioner than the latter half of pregnancy, which is only of importance in those

very rare cases of ectopic gestation that continue to develop and may in exceptional instances reach full term.

The symptoms are divided into:

The subjective symptoms.

The objective symptoms.

The Subjective Symptoms.—These are classified as follows:

1. Symptoms of early pregnancy.
   (*a*) Morning sickness.
   (*b*) Sensations of fullness of the breasts.
   (*c*) Amenorrhea.
2. Expulsion of the decidua vera.
3. Hypogastric and inguinal pains.
4. History of previous sterility.
5. Colostrum in the breasts.

Symptoms of Early Pregnancy.—In the majority of cases the early symptoms of a normal gestation are present and the patient believes herself pregnant. But in some instances these symptoms may be entirely absent and the first indication of her condition may be a sudden and severe internal hemorrhage from a ruptured tube. As in cases of normal pregnancy, the patient complains of morning sickness and a sensation of fullness of the breasts. Menstruation, as a rule, ceases when the pregnancy occurs; but in some cases it may not be interrupted, and, again, it may not stop until the time of the second or third monthly period, or there may be a cessation of the menses for one or two months, and after that time the flow may come on again. In cases in which the menses are uninterrupted a careful investigation of the patient's history will often elicit the fact that the flow has lessened in amount and shortened in duration.

Expulsion of the Decidua Vera.—The decidua vera is frequently thrown off by the uterus in the form of small pieces or shreds, or as a complete cast of the uterine cavity. The expulsion of the decidua is accompanied by metrorrhagia, and in some cases the hemorrhage is so severe that the patient believes she has miscarried. In other instances, however, the hemorrhage may be slight in amount, irregular in occurrence, often of a dirty brown color, and mixed with shreds of decidual membrane.

Hypogastric and Inguinal Pains.—The patient often complains of colicky pains in the hypogastrium and in one of the inguinal regions. These pains usually come on toward the end of the second month, recur from time to time at irregular periods, and are probably caused by uterine and tubal contractions.

Sterility.—The patient often gives a history of previous sterility.

Colostrum in the Breasts.—After the third month colostrum appears in the breasts.

The Objective Symptoms.—These are classified as follows:

1. Symptoms of early pregnancy.
   Changes in the external organs, the vagina, and the breasts; softening of the cervix; and enlargement of the uterus.
2. Presence of a distended tube.
3. Contractions of the wall of the gestation sac.
4. Microscopic examination of the cast or shreds thrown off by the uterus.

Symptoms of Early Pregnancy.—The changes which occur in the vulva and the vagina in a normal pregnancy are not noticeable until about the end of the third month, and consequently they are usually absent in cases of tubal gestation before that period. If an ectopic gestation does not terminate early, there

are more or less leukorrheal discharge, pigmentation of the vulva, and a violet or blue discoloration of the vagina. The vaginal arteries are enlarged and the pulsations may be felt by the examining finger. The breasts usually begin to enlarge after the first month and the superficial veins become more distinct. The areola becomes pigmented and swollen and the tubercles of Montgomery are hypertrophied. The cervix is softened and the os is patulous in cases of tubal pregnancy; softening of the uterine neck is an early sign and begins with impregnation. The uterus is always enlarged, but its size does not correspond with the supposed period of gestation, and hence this variation from the normal points to a tubal rather than to a uterine pregnancy.

Enlarged Fallopian Tube.—The enlarged tube is recognized by vagino-abdominal palpation and found to be situated either on one side of or posterior to the uterus. In very rare instances it may be in front of the uterus, and cases have been observed in which the tube was adherent to the fundus. The tubal mass is usually elongated or ovoidal in shape; it has a soft, boggy feel; and is generally tender or painful upon pressure. The examination must be very gently made, as rough manipulations are likely to rupture the tube and cause a fatal hemorrhage.

Contractions of the Gestation Sac.—Contractions of the wall of the gestation sac have been observed in a number of instances.

Microscopic Examinations.—The decidual character of the shreds of tissue which are mixed with the bloody discharge may be determined by a microscopic examination.

At the Time of Rupture or Abortion.—The symptoms are divided into: (1) the subjective and (2) the objective.

The Subjective Symptoms.—The symptoms of tubal rupture come on suddenly, as a rule, without any premonitory warning. In some cases, however, the patient may complain for a few days previously of colicky pains and slight pelvic pressure symptoms. The rupture may occur when the patient is in bed or when she is around attending to her daily duties, and in some cases it may follow an unusual or severe form of exertion. In extremely rare cases a rupture or an abortion may occur without producing marked symptoms and the patient may not be aware of her serious condition.

The patient is suddenly seized with severe pain which is quickly followed by collapse. The pain is felt over the lower abdomen and in the affected side of the pelvis. It is acute, agonizing, and excruciating in character, and at times so severe that the patient becomes unconscious at once. Symptoms of shock and collapse rapidly follow the occurrence of pain, and the pulse becomes weak and very rapid, or absent altogether; the temperature is subnormal; the respirations are sighing and shallow; the skin is anemic and has a deadly pallor; the eyes are glassy and the pupils dilated; the extremities are cold; the surface of the body is bathed with a clammy perspiration; the face has an anxious, pinched expression; and there is twitching of the facial muscles. Nausea and vomiting are common symptoms, and it is not unusual for delirium and convulsions to occur. If the patient is not unconscious, she may complain of impaired vision and of a singing sound in the ears.

The character and severity of the symptoms depend upon the situation of the rupture and the size of the hemorrhage. The symptoms of a tubal abortion resemble those of a tubal rupture, but usually they are less marked and the hemorrhage is not so severe. When the tube ruptures into the peritoneal cavity, the hemorrhage is usually profuse and continuous and the patient generally dies within a few hours unless she is saved by surgical interference. Occasionally, however, the bleeding stops spontaneously, reaction sets in, and the patient either

recovers or dies later on from a fresh hemorrhage. When the tube ruptures between the folds of the broad ligament, death seldom results from hemorrhage, as the blood is poured out into a confined space, and hence the bleeding is quickly controlled. The tearing apart of the structures of the broad ligament by the blood causes intense suffering, and if the distention is sufficiently great severe pressure symptoms develop.

The Objective Symptoms.—These are discussed under two headings, as follows:

Intraperitoneal rupture and tubal abortion.

Rupture between the folds of the broad ligament.

Intraperitoneal Rupture and Tubal Abortion.—Bimanual examination reveals a fullness in the culdesac of Douglas and the presence of an enlarged tube on one side or the other of the uterus. The distention behind the uterus is ill-defined in shape and imparts the sensation of free fluid to the examining finger. Later on, when the blood coagulates and the hematocele is enclosed by intestinal adhesions, a more or less distinct tumor of a doughy consistency is felt, which bulges somewhat into the vagina and extends upward into the abdomen, where it may be felt by abdominal touch. Under these conditions the uterus is pushed forward and the pelvic structures are crowded out of position.

Rupture between the Folds of the Broad Ligament.—A broad ligament hematoma forms a circumscribed, tense, elastic tumor, which is situated on one side or the other of the uterus, and which bulges downward into the vagina and upward above Poupart's ligament. It encroaches upon all of the pelvic organs and pushes the uterus toward the opposite side. The mass may also extend behind the cervix and surround the rectum, forming a constriction about the bowel which is easily felt by rectal touch. We are seldom able to palpate the uterine appendages or to recognize the enlarged tube on account of the size and the situation of the blood-tumor.

During the Latter Half of Gestation.—With the exception of certain variations the subjective and objective symptoms of gestation are alike in ectopic and normal pregnancies. I shall, therefore, simply point out these differences and not attempt to discuss the signs of pregnancy in detail.

Amenorrhea is not a constant symptom. Menstruation may or may not be present, and in some cases irregular hemorrhages accompanied with the discharge of decidual debris may occur throughout the entire period of pregnancy.

The fetal heart-sounds, the presence and the movements of the fetus, and ballottement are recognized earlier and are more distinct because the gestation sac is nearer the abdominal surface than in a normal pregnancy.

The shape of the abdomen is asymmetric. This want of symmetry, which is so characteristic of an ectopic pregnancy, is less marked after the seventh month, when the abdomen becomes well distended.

The phenomena of spurious or false labor occur at or near full term and the fetus dies. The pains, which resemble those of normal labor, vary in duration and intensity, and are accompanied by a bloody discharge containing shreds of decidual membrane.

The uterus continues to enlarge during the course of gestation, and at or near full term it measures from four to eight inches in length.

Diagnosis.—The diagnosis of ectopic pregnancy is discussed under the following headings:

Before primary rupture or abortion.

At the time of rupture or abortion.

During the latter half of gestation.

Before Primary Rupture or Abortion.—The diagnosis is seldom made

prior to the time of tubal rupture or abortion. The majority of patients believe themselves to be pregnant, and as there are no symptoms indicating an abnormal condition, the necessity of a physical examination is not apparent, and hence rupture or abortion often occurs before there is the slightest suspicion of an extrauterine gestation being present. This is especially true in those cases in which the rupture or abortion occurs very soon after impregnation; but when the gestation continues beyond the third month the subjective symptoms of pregnancy may show such marked irregularities that the patient is forced to seek advice, and a bimanual examination may reveal the presence of a soft mass at the side of or behind the uterus.

The symptoms upon which a diagnosis is based are classified as follows:

1. The subjective symptoms:
   (*a*) Symptoms of early pregnancy, such as morning sickness, sensation of fullness of the breasts, and amenorrhea.
   (*b*) Expulsion of decidual membrane or shreds.
   (*c*) Hypogastric and inguinal pains.
   (*d*) History of a previous sterility.
2. The objective symptoms:
   (*a*) Symptoms of early pregnancy, such as changes in the external organs, the vagina, and the breasts; softening of the cervix and enlargement of the uterus.
   (*b*) Presence of a distended tube.
   (*c*) Contractions of the wall of the gestation sac.
   (*d*) Microscopic findings in the membrane or shreds thrown off by the uterus.

At the Time of Rupture or Abortion.—The symptoms upon which a diagnosis is based are classified as follows:

1. The subjective symptoms:
   (*a*) A careful study of the previous history.
   (*b*) Sudden, acute, agonizing, excruciating pains over the lower abdomen and in the affected side of the pelvis which are followed by shock and collapse with symptoms of internal hemorrhage.
2. The objective symptoms:
   (*a*) The presence of an enlarged tube.
   (*b*) Hypertrophy of the uterus and softening of the cervix.
   (*c*) The presence of free blood in the pelvis or a broad ligament hematoma.

During the Latter Half of Gestation.—The diagnosis is based upon a careful study of the subjective and objective symptoms as described on page 565.

Treatment.—The treatment of ectopic gestation is operative under all circumstances and conditions and our sole object in view must always be the safety of the mother, as the child has no claims whatever to be considered even in those very rare cases in which gestation continues until viability is reached. The dangers, under these conditions, through which the patient must necessarily pass overwhelm absolutely any argument that may be advanced in favor of the life of the fetus, which, as stated above, is worth but little on account of its low vitality and defective development, as well as the practical certainty of its death early in infancy.

The rule which guides my practice in cases of ectopic gestation is to operate by the abdominal route at once whenever the condition is recognized or sus-

pected, irrespective of the period of pregnancy or the presence or absence of the placental bruit.

For technic reasons the treatment should be considered under the following conditions:

Before primary rupture or abortion.
At the time of rupture or abortion.
Subsequent to rupture or abortion.
During the latter half of gestation.

Before Primary Rupture or Abortion.—The indication is to remove the impregnated tube at once. Unfortunately, however, cases of tubal gestation are seldom recognized prior to rupture, and in the majority of patients operated upon before that time the true condition was not suspected, as the operations were performed for supposed tubo-ovarian disease. As Penrose says: "The cases show the value of the general rule to operate without delay for all gross diseases of the tubes."

Operation.—The technic is very simple and the impregnated tube may be easily removed, as in the case of a hydrosalpinx, without rupture, and hence the case is not complicated by the escape of the contents of the gestation sac into the peritoneal cavity.

If the ovary is healthy, the tube alone should be removed (*salpingectomy*, p. 577); but if it is diseased or badly adherent, both organs should be extirpated (*salpingo-oöphorectomy*, p. 973).

At the Time of Rupture or Abortion.—The indication is to operate in every case without unnecessary delay, whether the tube has ruptured into the peritoneal cavity or between the folds of the broad ligament. We must not wait for reaction from collapse or shock to set in before operating, as the patient may perish in the meantime from loss of blood. I am well aware of the advantages to be gained by not operating during collapse if it can be avoided, but we must remember that the case is one of internal hemorrhage, and hence the dangers of delay offset all other considerations; besides, it is unwise to stimulate the patient by saline injections and other means until everything is ready to open the abdomen, for the reason that under these circumstances the hemorrhage is likely to start again with renewed vigor and force.

Operation.—As rupture generally occurs between the fourth and the twelfth week, the entire tube, which of course contains the seat of implantation of the fertilized ovum, is easily removed by salpingectomy; the ovary should not be extirpated unless it is diseased or extensively adherent. The details of the technic of salpingectomy and salpingo-oöphorectomy are fully discussed in another chapter (see p. 577 and p. 973) and need not therefore be described here. When, however, either of these operations is performed for tubal rupture, there are certain variations in the technic which must be clearly understood and appreciated by the surgeon.

These variations are summarized as follows:

1. In sterilizing the abdomen rough manipulations must be avoided, as they are likely to disturb the seat of rupture and start a fresh hemorrhage.

2. Before anesthetizing the patient all the preparations for the operation must be completed in order that the duration of the anesthesia may not be unnecessarily increased by subsequent delays.

3. Stimulation by means of an intravenous injection of normal salt solution is begun so soon as the surgeon starts to open the abdomen and continued throughout the operation. If the loss of blood has been great, it may be necessary to administer the saline after the operation is finished and inject several quarts of the solution before the cannula is finally withdrawn from the vein.

This method of employing normal salt solution in cases of ruptured tubal pregnancy has undoubtedly saved many lives that would otherwise have been lost, and should therefore be used as a routine practice.

4. The patient should be placed in the Trendelenburg posture during the operation to keep the blood in the head and upper part of the body.

5. As soon as the abdomen is opened the operator must at once search for the impregnated tube and bring it into the abdominal wound. If the vessels are bleeding at the time he immediately applies hemostatic forceps to the uterine and pelvic ends of the broad ligament which control the hemorrhage from the proximal and distal portions of the ovarian artery. Ligatures are now substituted for the clamps and the tube is then removed.

6. After extirpating the tube the blood-clots and debris, which include the embryo when it can be found, are removed by the hand, and if necessary the abdominal and pelvic cavities are flushed with normal salt solution. If there is much shock or collapse, it is often advisable to leave some of the salt solution in the abdomen, as it rapidly becomes absorbed and acts as a general stimulant.

The question of drainage depends upon the nature of the case.

7. When the rupture has taken place between the folds of the broad ligament, the operative technic is the same as above, with the exception, however, that the opening into the ligament must be closed subsequently with buried catgut sutures.

Subsequent to Rupture or Abortion.—There is a class of cases in which the patient is not seen until she has recovered completely from the effects of the primary rupture, and under these conditions the question of operative interference at once arises. The danger of secondary hemorrhage or infection occurring in these cases far overbalances the possible advantage to be gained by waiting for the spontaneous removal of the blood and debris by absorption, and consequently immediate laparotomy is always indicated.

During the Latter Half of Gestation.—The indication in these cases is to remove the fetus by laparotomy. The operative technic depends upon the period of gestation and also whether the fetus is living or dead.

PRIOR TO THE END OF THE FOURTH MONTH the entire sac may usually be extirpated without causing uncontrollable hemorrhage, and consequently the placental circulation, in cases in which the fetus is living, does not materially complicate the operation. The complete removal of the gestation sac which includes the embryo and the placenta is comparatively simple in cases of unruptured tubal pregnancy, and the bleeding is easily controlled by ligating the pelvic and uterine ends of the ovarian artery before removing the impregnated tube and its contents. When, however, the sac is situated between the folds of the broad ligament, the operation is necessarily more difficult, but in the hands of an expert operator the hemorrhage is readily controlled and the entire mass removed. This is accomplished by ligating the ovarian and uterine arteries before removing the affected tube and enucleating the gestation sac and its contents. After the extrauterine mass has been extirpated the cavity in the broad ligament is closed with buried catgut sutures. If the case is one of primary tubal rupture or abortion with continuation of fetal life, the hemorrhage may usually be controlled by ligating both ends of the ovarian artery as well as any large vessels that may be seen passing to the sac. It is also advisable, as a guard against hemorrhage, to pass deep ligatures through the tissues at the seat of attachment and then to cut the sac away at this point with a knife or scissors.

After the Fourth Month of gestation the operative technic depends upon whether the fetus is living or dead. While the fetus is alive it is almost impossible to remove the placenta without causing an uncontrollable hemorrhage. This is due in many cases to the widespread attachment of the placenta over the pelvic organs, the intestines, and the large blood-vessels, and hence it is impossible to stop the excessive bleeding which occurs by ligating the ovarian and uterine arteries. When, however, the fetus dies, the placental circulation gradually becomes obliterated by the formation of thrombi, and at the end of one or two weeks the vessels are completely obliterated and the bruit can no longer be heard. In three or four weeks from this time the thrombi become thoroughly organized, and consequently there is but little, if any, danger of hemorrhage when the placenta is separated from its attachments at the time of operation.

The treatment of these cases may be summarized as follows:

Fetus Living.—Laparotomy should be performed as soon as the condition is recognized. The many dangers incident to the continuation of an abnormal gestation make it inadvisable to wait until the fetus dies at term and the placental circulation becomes obliterated.

The operation is performed as follows: After opening the abdomen the sac is incised and the fetus removed. The cord is then ligated as close as possible to the placenta and cut away. The sac is now stitched to the lower edges of the abdominal wound, cleaned with gauze sponges, and packed with a wide strip of plain sterile gauze. The gauze packing is removed in forty-eight hours and a glass drainage-tube substituted which is kept in position until the sac becomes obliterated. At the end of one or two weeks the placental circulation ceases and the placenta gradually begins to come away piecemeal, until finally it is all removed and the sac closes.

If the placenta is accidentally separated or injured during the operation an attempt must be made to save the patient's life by instantly compressing the aorta and ligating the ovarian and uterine arteries as well as any vessels that may be discovered passing to the seat of implantation.

The post-operative dangers to be feared are secondary hemorrhage and septic infection.

Fetus Dead.—Laparotomy should be performed at once and the placenta removed at the time of operation.

Treatment of an Interstitial Pregnancy.—In cases of intraperitoneal rupture the uterus should be saved if possible by removing the tube and suturing the opening in the uterine cornu; if this cannot be done, supravaginal hysterectomy is indicated.

CHAPTER XXVI.

HYSTERECTOMY FOR DISEASED APPENDAGES.

The question often presents itself at the time of an operation in which double salpingo-oöphorectomy has been performed as to whether or not the uterus should also be removed. The unsatisfactory results met at times after the removal of the uterine appendages for well-marked lesions have led to an inquiry as to the

reason why these patients should continue to suffer with pelvic pains, leukorrhea, and bloody discharges as well as many reflex and general disturbances. There can be no doubt whatever that in some of these cases the bad results are due to an incomplete removal of the tubes and that the remaining portions act as foci of irritation and infection which prevent the usual atrophic changes from taking place in the uterus. But this cause does not by any means explain the bad symptomatic results which sometimes follow double salpingo-oöphorectomy in the hands of skilful operators, and we have been forced therefore to look for another explanation, which has been found to be a coexisting diseased condition of the uterus. In other words, these patients have not been benefited by the removal of the uterine appendages because the entire focus of disease was not eradicated.

Indications.—The indications for hysterectomy should be clearly understood, not only because of the necessity for the removal of the uterus in these cases, but also because the operation should not be heedlessly performed and the patient exposed to additional risks.

The chief indications are as follows:

1. When the uterus is decidedly enlarged or subinvoluted.
2. When chronic purulent endometritis and metritis exist.
3. When the tube is friable and the ligature cuts through the pedicle.
4. When the uterus becomes torn or badly mutilated during the separation of adhesions.
5. When the uterus and the appendages are matted together and form an infected mass.

Technic.—The uterus should be removed by incomplete or supravaginal hysterectomy (see p. 984). Complete hysterectomy is never indicated in these cases, unless some special reason exists; first, because the entire removal of the uterus adds decidedly to the dangers of the operation, and, second, because if the cervix is left in place it acts as a support to the vaginal vault and prevents shortening of the vagina.

CHAPTER XXVII.

EFFECTS OF THE REMOVAL OF THE UTERINE APPENDAGES.

The results following double salpingo-oöphorectomy may be conveniently classified into:

The symptomatic results.
The symptoms of the artificial menopause.
The effect upon the sexual appetite.
The effect upon the mind.
The general effects.

The Symptomatic Results.—In the majority of cases a slight hemorrhage takes place from the uterus within twenty-four to forty-eight hours after the operation which usually lasts for several days, but which has no pathologic significance. It is probably due to the acute uterine congestion which is caused by the sudden change in the pelvic circulation when the tubes and ovaries are ligated and removed.

Atrophy of the uterus takes place, as a rule, after the removal of the appendages, and menstruation permanently disappears when the bleeding which usually occurs immediately after the operation has stopped. In some cases the flow may recur for one or more periods; in others nothing may be seen for

several months after the operation, and then it may return and appear several times before it entirely ceases; and, finally, it may continue indefinitely. Cases of continued periodic hemorrhage from the uterus are at times difficult to explain, because we know that if the tubes and ovaries have been completely removed atrophy of the uterus, as a rule, promptly takes place and the function of the organ is destroyed. We must therefore conclude, when regular or irregular hemorrhages occur, that there had been some fault in the operative technic, and that a portion of the tube was left or all of the ovary had not been removed, which is likely to occur when extensive and firm adhesions attach it to the broad ligament or the pelvic wall. Again, the hemorrhages may be caused by an irritation in and around the stump which causes congestion of the parts, or they may result from inflammation or a neoplasm of the uterus.

As a rule, if the patient suffers with endometritis prior to the removal of the appendages the subsequent atrophy which takes place in the uterus cures the inflammation of the endometrium and the leukorrheal discharge gradually disappears. Sometimes, however, this is not the case, and the discharge, like the hemorrhages, may continue indefinitely when the uterus is enlarged or subinvoluted or the seat of a deep-seated and intractable chronic purulent endometritis.

Pain is the most prominent symptom of tubo-ovarian disease, and it is very important, therefore, that the patient should be given some idea of the results which may be expected to follow removal of the appendages. In some cases the relief from pain is marked and immediate; in others it may not disappear entirely until the general health of the patient is improved and the pelvic organs have had time in which to readjust themselves to the new conditions caused by the formation of fresh adhesions at the site of operation; and, finally, more or less pelvic discomfort and distress may remain indefinitely. The continuance of pelvic pain after double salpingo-oöphorectomy results most frequently from fresh adhesions occurring between the pedicles or denuded surfaces in the pelvis and the omentum, the intestine, the bladder, or the rectum. Sometimes it is caused by the pressure of a ligature upon the nerve-filaments in the stump of the pedicle, and it may also be due to pathologic conditions of the uterus.

The general health of the patient gradually improves, as a rule, after the removal of the diseased appendages. The reason for this is readily understood when we recall that the operation relieves the intense suffering, the uterine discharges, and the gastro-intestinal disorders which have been for years exhausting the strength and impairing the nutrition of the patient. We must not, however, look for a complete return to the normal condition in all cases, because the damage done by the disease in the pelvis is often so extensive and the general condition of the patient so weakened and impaired that she can never hope to enjoy perfect health again. But we may in nearly all cases hope to relieve the state of bed-ridden invalidism and restore her to comparative health and usefulness.

The Symptoms of the Artificial Menopause.—Double salpingo-oöphorectomy creates an artificial menopause with nervous and gastro-intestinal symptoms similar to those following the natural climacteric except that they are often more marked and apt to last longer. We cannot, therefore, expect to obtain the full beneficial results of the operation until these phenomena have subsided, which in many cases may not be for one or two years or even longer. The nervous symptoms which do not, as a rule, appear for several weeks after the operation generally manifest themselves in the form of vasomotor disturbances, and the patient complains of flushes of heat followed by perspiration and a feeling of chilliness. In some cases the patient may complain of headaches,

disturbances of vision and hearing, vertigo, sleeplessness, somnolence, bleeding from the nose, faintness, depression of spirits, and a feeling of numbness, especially in the lower extremities. The gastro-intestinal disturbances, as a rule, are not marked, although many of these patients are constipated and suffer more or less from dyspepsia and flatulence.

The Effect upon the Sexual Appetite.—Generally speaking, the effect upon the sexual appetite differs but little, if any, from that of the natural menopause. In the majority of cases the sexual desire is increased because the woman is restored to health by the operation and she no longer suffers from pelvic tenderness and painful coitus. In rare cases, however, it may be diminished and at times even destroyed by the removal of the uterine appendages.

The Effect upon the Mind.—It seems unlikely that the removal of the uterine appendages is ever directly the cause of insanity, and so far as my own experience goes I have never met such a case. Women have undoubtedly become insane after double salpingo-oöphorectomy and at the time of the natural menopause, but I believe a careful analysis of these cases would show that an inherited predisposition to insanity existed and that the usual nervous disturbances accompanying the change of life, whether artificial or natural, were the exciting causes of the mental breakdown.

Neurasthenic women belong to a class in which the nervous phenomena of the artificial menopause are most marked, and they consequently exhibit mental symptoms which may last for an indefinite length of time. The loss of the uterine appendages may eventually cause despondency or even melancholia in young women who become anxious later on to have children, but who have lost forever the power to conceive. In these cases the mental condition is often distressing, and, as nothing can be done to remove the cause, we must wait until the lapse of time has lessened the desire for children and given the patient the courage to bear her burden.

The General Effects.—The popular impression that double salpingo-oöphorectomy causes a woman to lose her feminine attractions is an error. There is never any tendency whatever toward the development of the masculine type, and there is no growth of hair upon the face, no change in the voice, or alteration in the figure. In some cases the patient may become fat and matronly looking; in others, again, she may not show any tendency toward obesity; and, finally, the relief experienced from suffering causes the majority of women to become more attractive in their personal appearance.

If the operation is performed prior to puberty, the sexual development of the girl is arrested.

CHAPTER XXVIII.

CONSERVATIVE OPERATIONS ON THE UTERINE APPENDAGES.

Definition.—A conservative operation on the uterine appendages is one in which the operator endeavors to preserve their functions by not removing a healthy tube or ovary and by saving any portion of either organ that is sound.

While such operations are still in the experimental stage, yet enough has certainly been accomplished to warrant the belief that, as our experience grows and we become better able to select the cases in which conservatism is indicated,

many of the radical procedures that are now advised will gradually become more and more restricted in their application.

Advantages of Conservatism.—The advantages derived from conservative operations on the tubes and ovaries consist in the conservation of the functions of these organs and the prevention of the mental and physical disturbances which so often follow the artificial induction of the menopause.

Ovulation, in all probability, is not the sole function of the ovary, and there are reasons for believing that it also has an internal secretion which plays an important rôle in the physical economy. Howard A. Kelly says: "There is a growing conviction that the ovary belongs to the same group of organs as the thyroid, thymus, and pineal glands, and that, in addition to its function of ovulation, it secretes a substance which is absorbed and consumed in the animal economy, and which is necessary to it in retaining its physiologic balance." If this view is correct, the loss of this substance may be the cause of many of the phenomena which occur at the time of the natural menopause or after the removal of the uterine appendages, and is consequently an argument in favor of conservatism.

We have practically no knowledge of the excretory and metabolic influences of menstruation upon the physical economy, but we know from clinical experience, however, that the natural as well as the artificial menopause is accompanied by nervous and gastro-intestinal disturbances. Perhaps the most serious results which occur at times after double salpingo-oöphorectomy are due to the effect of the cessation of menstruation upon the mind of the patient, especially if she is young and anxious to have children. The knowledge under these circumstances that she is sterile and forever incapable of conception may give rise to grave psychic disturbances and even confirmed melancholia, and for this reason alone it may be advisable to leave a small portion of ovarian tissue to maintain ovulation and menstruation even when the chances of a future pregnancy are most problematic.

Disadvantages of Conservatism.—While conservatism, as we have just seen, has certain well-defined reasons in its favor we must not lose sight of the fact that there are valid arguments against resecting diseased tubes and ovaries. The principal objections that have been urged against conservatism are:

1. The unlikelihood of restoring function.
2. The return of the disease in the resected organ.
3. The occurrence of the disease in the opposite side after a unilateral operation.
4. The failure to effect a symptomatic cure.
5. The risks of an ectopic gestation.
6. The danger of infection following resection.
7. The unnecessary risk to life from a secondary operation.

The Unlikelihood of Restoring Function.—Ovulation, as a rule, is not interrupted by disease of the ovaries, and we find from experience that the function continues if a small piece of the ovary is preserved at the time of operation. The function of the Fallopian tube, on the other hand, is usually permanently damaged by inflammatory conditions which are liable to obliterate its lumen and destroy its usefulness as a channel through which the ovum reaches the uterus. There is no doubt, however, that a badly damaged tube may occasionally undergo a spontaneous restoration to normal conditions and pregnancy take place after a long period of acquired sterility. If this is true, there is no reason, in well selected cases, why the same results should not follow a conservative operation, and in point of fact recent clinical experience justifies this opinion.

The Return of the Disease in the Resected Organ.—The probability of the return of the disease must, of course, be admitted by all operators who are exponents of conservatism, but when we consider the possible advantages to be

gained by conservative operations in properly selected cases this objection does not hold good, especially when the patient is willing to take these chances rather than submit to complete mutilation. Again, we must bear in mind that there are certain pathologic conditions of the tubes and ovaries that will be referred to in discussing the indications for conservatism, in which there is but little liability of the disease attacking the healthy structures left behind.

The Occurrence of the Disease on the Opposite Side after a Unilateral Operation.—There is no doubt whatever that the opposite tube is liable to become affected after a unilateral operation for inflammatory disease. This is due to the fact that the uterine endometrium is the source of infection, and that unless the disease is eradicated in the uterus it will sooner or later spread to the sound tube. We are usually able to prevent this by cureting and applying pure carbolic acid to the endometrium immediately after the diseased tube has been removed. The risks of the disease occurring on the sound opposite side vary according to the nature of the infection, and as this subject will be considered fully in discussing the indications for conservatism, it will suffice to state here that cases of purulent salpingitis and pyosalpinx are more likely to cause trouble after a unilateral operation than simple catarrhal forms of inflammation and hydrosalpinx.

The Failure to Effect a Symptomatic Cure.—While it is true that a symptomatic cure may not always be effected by a conservative operation, yet it is equally a fact that the complete removal of the tubes and ovaries is often disappointing from the same standpoint. It is obviously unjust, therefore, to attribute to conservatism the post-operative pain which sometimes persists, unless it can be shown that the disease has recurred in the structures left behind, because the same symptom not infrequently continues after radical procedures in which both appendages were completely removed. This is readily explained when we remember that post-operative pains are often due to fresh adhesions occurring between surfaces within the pelvis that were denuded and torn during the enucleation of adherent organs, and that these intrapelvic conditions have nothing whatever to do with the conservative or radical nature of the operation. If conservatism is taken to mean the partial or incomplete removal of grossly diseased structures, then, as a matter of course, we cannot expect any relief from the pain or the other subjective symptoms which are so constantly associated with tubo-ovarian disease. But if a conservative operation removes all the diseased portion of an organ, there is no reason why the remaining part which is healthy should be responsible for the failure to effect a symptomatic cure unless, as stated above, the disease recurs.

The Risks of an Ectopic Gestation.—The fact that salpingitis, which is usually bilateral, is the great cause of ectopic gestation, on account of the supposed desquamation of the ciliated epithelium which often takes place as the result of the inflammation, would lead us to believe that conservatism would frequently be responsible for an extrauterine pregnancy in cases of unilateral operations or in resections of the tubes. Our clinical experience, however, does not bear out this view, and according to Kelly, "No case has ever yet been reported where a conservative operation has been followed by an ectopic pregnancy."

The Danger of Infection Following Resection.—This objection to conservative operations on the tubes and the ovaries is an unanswerable one in cases where pus is present, as the danger of infection under these conditions is extremely great and cannot usually be guarded against. But in cases that are non-purulent in character there is no such risk and a resection should not increase the operative mortality in the slightest.

The Unnecessary Risk to Life from a Secondary Operation.—The possible benefits which may be derived from conservatism outweigh in many instances the chances of the necessity for and the dangers of a secondary operation. Whether or not this statement is a correct view of the case the fact remains that the patient should always be given an opportunity to decide for herself the amount of risk she is willing to take in order to prevent the loss of organs that play such an important rôle in the physical economy.

The Results of Conservatism upon Sterility.—In a general work on gynecology it is obviously impossible to devote sufficient space to an analytic consideration of this subject, and I shall therefore discuss it very briefly. Remarkable instances of pregnancy following conservative work on the uterine appendages have been observed by different operators, and hence no doubt can exist as to the curative influence of conservatism upon sterility in properly selected cases. These observations have shown that conception has followed conservative operations upon almost every known pathologic condition of the appendages. Thus, adherent tubes, ovaries, and uteri have been liberated and restored to their normal functions. The tube has been made patulous by breaking up adhesions about the abdominal opening and by amputating its distal portion in cases of chronic salpingitis with occlusion and in cystic distentions caused by the accumulation of pus, blood, or serum. Pregnancy has also occurred after puncturing cysts of the Graafian vesicles and corpus luteum; after resecting the ovary and leaving a small piece of ovarian tissue; and after excision of a hematoma.

The removal of the uterine appendages on one side does not make a woman sterile provided the functions of the tube and ovary on the opposite side are preserved. Clinical experience has demonstrated that ovulation continues if a small piece of ovarian tissue is left, and under these circumstances pregnancy is possible if the tube is patulous even when it has been resected and nothing but a short stump remains. Kelly has reported the occurrence of pregnancy "after leaving one tube and the opposite ovary," which proves the possibility of conception taking place with the only remaining tube and ovary situated on opposite sides of the uterus.

Atrophy of the ovary does not necessarily interfere with ovulation, and such an organ should not be sacrificed if the opposite side is removed, as pregnancy has been known to follow a conservative operation which left only a single atrophic ovary.

General Contraindications.—Conservative operations upon the uterine appendages should not be undertaken without having a clear conception of the contraindications to this form of surgery, otherwise serious or unsatisfactory results are certain to follow, and conservatism will therefore be held responsible for failures which should justly be placed upon the inexperience or ignorance of the operator.

The following are the chief contraindications to conservative operations:

The presence of pus.
The age of the patient.
Malignant disease.

The Presence of Pus.—Pus is a positive contraindication to conservatism, and no attempt should be made to save a portion or the whole of an organ that is the seat of a purulent inflammation. I am well aware in making this statement that it is opposed to the views of many of the active exponents of conservative surgery on the uterine appendages, yet when we take into consideration the risks of infection as well as the great probability of failing to restore function, the few successful cases that have been reported do not in my judgment

offer an argument of the slightest value in favor of conservatism under these conditions.

The Age of the Patient.—The age of the patient must always be considered in deciding the question of conservatism, as the necessity for preserving the functions of the uterine appendages in a young woman is far more important from every point of view than in a woman who is approaching or who has passed the menopause. In the latter case the desire as well as the ability to conceive is usually lost, and hence the function of ovulation need not be considered. Under these conditions, therefore, there is no necessity to preserve the uterine appendages, and consequently conservatism is contraindicated. The possibility of serious nervous disturbances as well as the effect upon the system from the loss of the internal ovarian secretion, after an artificial menopause in a woman who is nearing the natural climacteric, is not of sufficient importance, in view of our present knowledge, to offer a practical reason in favor of conservatism in these cases.

Malignant Disease.—As a matter of course, conservatism is contraindicated in malignant disease, and the ovary or the tube should never be resected under these conditions.

The opposite ovary should always be removed, as the disease is bilateral in the majority of cases; and even if it is apparently healthy at the time of the operation, it is liable sooner or later to become involved. The only exception I make to this rule is in the case of a young woman, provided she is willing to assume all the risks of recurrence and to place herself under observation for an indefinite period of time.

Malignant disease of the tubes is nearly always secondary, and it therefore demands a mutilating operation which involves also the removal of the uterus.

Indications for Conservative Operations on the Fallopian Tubes.—If the uterus or both ovaries are removed, there is no reason for preserving the tubes, as their use is merely that of a channel through which the ovum passes to the uterus, and under these conditions allowing them to remain would be to run the unnecessary risks of a subsequent tubal infection.

If only one tube is diseased, its fellow on the opposite side should not be removed, notwithstanding its liability of becoming infected later on. The danger of the occurrence of the disease in the sound tube after a unilateral operation should be thoroughly explained to the patient and she should be advised to take the chances of a secondary operation becoming necessary rather than submit to a mutilation that would result in permanent sterility.

The following tubal lesions are amenable to conservative methods:

Adhesions.
Occluded tubes.
Benign tumors.

Adhesions.—The tube may be adherent to the uterus, the broad ligament, the ovary, the floor of the pelvis, or to the intestine, and its function destroyed by the twisting and kinking which the adhesions cause. In these cases the interior of the tube is not involved and the separation of the adhesions is followed by the restoration of function. Adhesions of this character generally represent an old inflammation the activity of which has long since passed, leaving the tube bound down and distorted without causing any organic changes in its walls.

Occluded Tubes.—Conservative operations may be performed upon a closed tube provided its uterine end is not diseased and pus is absent. The distal end of the tube may be amputated in the following lesions:

Hydrosalpinx and hematosalpinx.
Chronic catarrhal salpingitis.

If the occlusion is caused by adhesions about the fimbriated extremity, they can usually be broken up and the function of the tube restored without resorting to resection.

Benign Tumors.—The entire tube should not be sacrificed when it is occupied by a neoplasm unless the growth involves the whole organ. If the tumor is situated in the distal portion, an amputation should be performed and the uterine end of the tube left to carry on the function of the organ.

Indications for Conservative Operations on the Ovaries.—The importance of the ovaries to the animal economy has already been discussed, and from what has been said it is evident that they should only be removed for gross disease and not simply because the uterus or the tubes are extirpated. For the same reasons if possible an effort should always be made to save both the tube and ovary in the case of a parovarian cyst which can often be enucleated without sacrificing these organs.

The following ovarian lesions are amenable to conservative methods:

Adhesions.
Cysts of the Graafian vesicles and corpus luteum.
Hematoma.
Glandular and dermoid cysts.
Benign tumors.
Prolapse.
Atrophy.

Adhesions.—The ovaries, like the tubes, may be adherent to any of the pelvic structures. The adhesions vary greatly in character, and in some cases they may be so dense and extensive that the ova are unable to escape; in others they may so alter the normal relations existing between the tube and the ovary that conception is practically impossible for mechanic reasons. The separation of these adhesions is usually followed by the normal escape of the ova and the organ is placed in proper relations with the fimbriated extremity of the tube.

Cysts of the Graafian Vesicles and Corpus Luteum.—Graafian cysts are seldom sufficiently large or numerous to warrant the removal of the ovary and are usually amenable to treatment at the time of operation without sacrificing any of the ovarian tissue. The same is true of cysts of the corpus luteum, which, as a rule, do not grow larger than a cherry or a walnut, and are not intimately connected with the tissue of the ovary.

Hematoma.—If the hematoma is small, the ovary should not be sacrificed; but if the hemorrhage has been excessive and the whole organ is involved, it should be removed.

Glandular and Dermoid Cysts.—The whole ovary should be removed if the disease is unilateral, but when both ovaries are the seat of a cyst we should endeavor to preserve some of the ovarian tissue if it can be found.

Benign Tumors.—A small tumor should be excised and a portion of the ovary saved.

Prolapse.—The displacement of an ovary is not in itself an indication for oöphorectomy, and the organ should never be sacrificed under these conditions unless it is the seat of a gross lesion.

Atrophy.—If the disease is bilateral, the least damaged of the two ovaries should be saved. Atrophied ovaries are usually found embedded in dense adhesions and the subjective symptoms are generally relieved when the organs are released.

Technic of Conservative Operations on the Fallopian Tubes.—**Unilateral Disease.**—If the ovary is healthy, the tube alone should be removed.

A ligature is passed through the broad ligament under the tube, the ovarian ligament, and the uterine end of the ovarian vessels, and tied over these structures as close as possible to the cornu of the uterus. The tube is then cut away from the upper edge of the broad ligament with scissors and amputated close to the ligature at the side of the uterus. The divided edges of the broad liga-

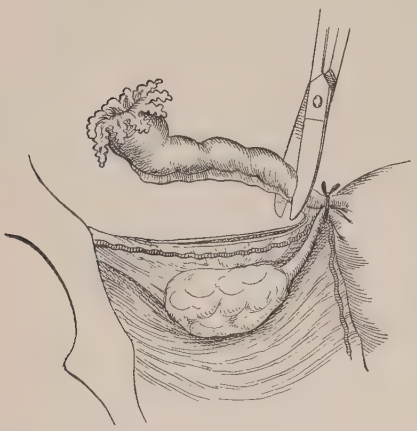


Fig. 504.

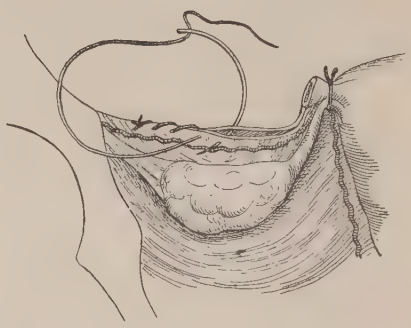


Fig. 505.

Conservative Operations on the Fallopian Tubes.
Showing the operation of salpingectomy for unilateral tubal disease.

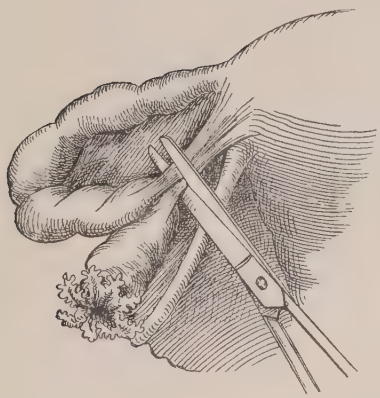


Fig. 506.

Fig. 507.

Conservative Operations on the Fallopian Tubes.
Showing the removal of adhesions between the tube and the uterus. Note the disappearance of the kink in the oviduct after the adhesions have been cut (Fig. 507).

ment are then brought together and the opening closed with a continuous overhand suture of catgut or fine silk.

After the abdominal operation is finished the patient is placed in the dorsal position and the uterine cavity cureted and swabbed with pure carbolic acid (see p. 955).

Adhesions.—No definite rules can be given governing the breaking-up of adhesions to free the tube, and each case must therefore be managed according

to the conditions present. The operator must be careful not to injure the tube, and if the adhesions cannot be easily separated with the fingers the parts should be exposed and cut with blunt-pointed scissors. If the tube cannot be felt or seen, the cornu of the uterus should be brought into view in order to trace the tube from its uterine end to where it lies covered by adhesions. After the tube has been released from its abnormal attachments it should be carefully examined to see if it is twisted or kinked upon itself and the adhesions which are present cut with scissors and the organ restored to its normal shape.

Resection.—Resection of the oviduct is performed as follows: The operator grasps the distal portion with his fingers, and while making slight traction the tube is amputated with scissors beyond the area of disease. After controlling the bleeding with ligatures the peritoneal and mucous coats of the tube are united by interrupted catgut or fine silk sutures in order to establish a permanent opening. If the abdominal opening is very small, it may be enlarged by slitting the tube for a distance of half an inch, if the length of the tube is sufficient to permit it, and uniting the peritoneal and mucous coats.

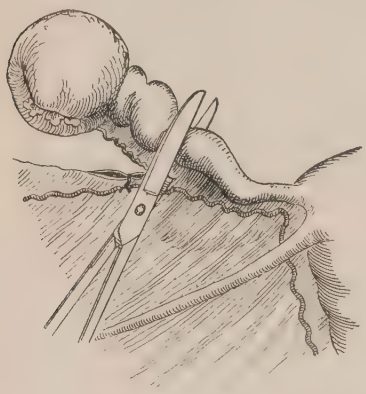


Fig. 508.

Fig. 509.

Conservative Operations on the Fallopian Tubes.

Showing the resection of a diseased tube. Note the probe passed through the tube into the uterus and the method of suturing the stump in figure 509.

Before completing the operation a fine probe is passed into the uterus to test the condition of the uterine opening of the tube.

Technic of Conservative Operations on the Ovaries.—**Resection.**—The operation of resection, which is employed, as already stated, for lesions which involve only a part of the ovary, consists in excising the diseased portion with a knife or scissors and uniting the edges of the wound by continuous catgut or fine silk sutures (Figs. 510 and 511).

Adhesions.—Adhesions of the ovary are treated on the same principles as those of the Fallopian tube (Figs. 512 and 513).

Cysts of the Graafian Vesicles and Corpus Luteum.—Small cysts should be punctured and their contents allowed to escape. A large cyst should be incised, its walls removed, and the edges of the wound brought together with a continuous suture of catgut or fine silk (Figs. 514, 515, and 516).

Hematoma.—If a hematoma does not involve the whole ovrry, the affected portion is excised and the wound closed with a continuous catgut or fine silk suture (Figs. 517 and 518).

Glandular and Dermoid Cysts.—In large cysts of the ovary it is very difficult and often impossible to discover any normal ovarian structures. According to Kelly, however, the base of a glandular cyst may occasionally contain normal ovarian tissue, and he further states that "the best guide to discover such a portion of sound tissue is the utero-ovarian ligament, which can always be found."

If apparently sound ovarian tissue is discovered, the cystic portion of the ovary is removed and the wound treated as in cases of resection.

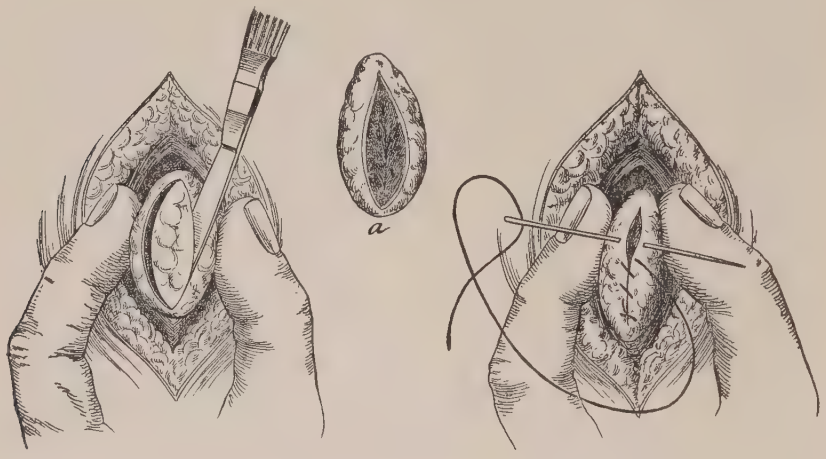


FIG. 510. FIG. 511.

CONSERVATIVE OPERATIONS ON THE OVARIES (page 579).

Fig. 510 shows the diseased portion of the ovary being excised; Fig. 511 shows the method of suturing the raw surfaces; illustration *a* shows the appearance of the ovary after the diseased portion has been removed.

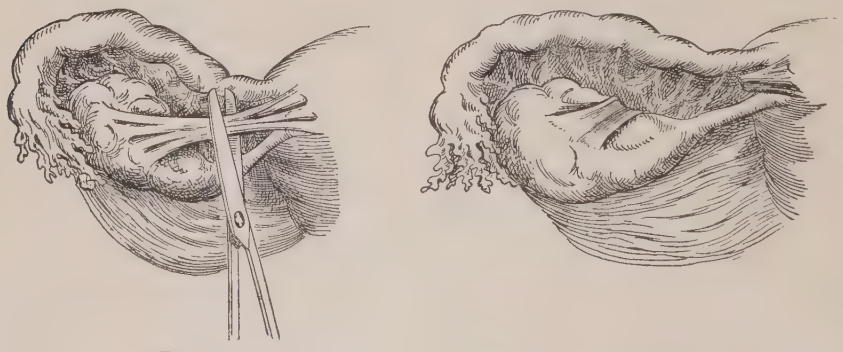


FIG. 512. FIG. 513.

CONSERVATIVE OPERATIONS ON THE OVARIES (page 579).

Showing the removal of adhesions between the ovary and the uterus.

Benign Tumors.—If the tumor does not involve the entire ovary, the operation of resection is performed and the wound closed with a continuous catgut or fine silk suture.

Prolapse.—As already stated, prolapse is not in itself a reason for sacrificing the ovary, and unless the organ is the seat of a gross lesion it should be restored to its normal position by operative means. This is accomplished by shortening

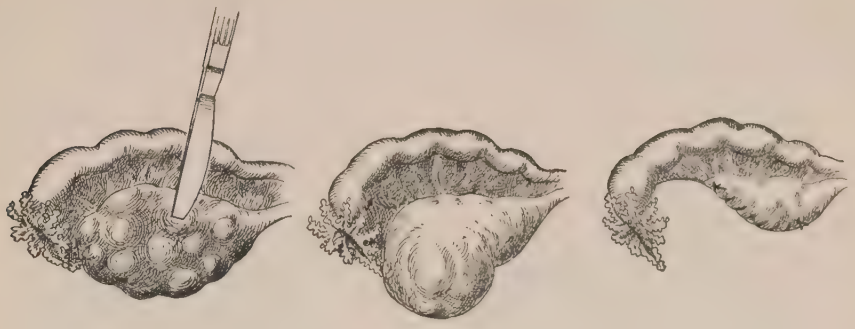


FIG. 514. FIG. 515. FIG. 516.

CONSERVATIVE OPERATIONS ON THE OVARIES (page 579).

Fig. 514 shows the method of puncturing small cysts of the Graafian vesicles; Fig. 515 shows a large cyst of the corpus luteum; Fig. 516 shows the appearance of the ovary after the removal of the cyst.

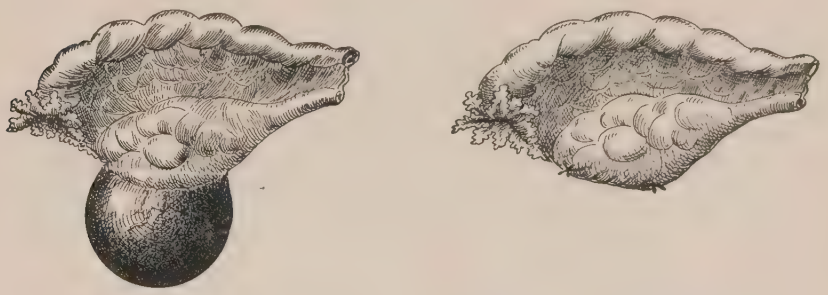


FIG. 517. FIG. 518.

CONSERVATIVE OPERATIONS ON THE OVARIES (page 579).

Fig. 517 shows a large hematoma of the ovary; Fig. 518 shows the appearance of the ovary after the removal of the hematoma.

FIG. 519. FIG. 520.

CONSERVATIVE OPERATIONS ON THE OVARIES.

Fig. 519 shows a large benign tumor of the ovary; Fig. 520 shows the appearance of the ovary after the removal of the tumor.

the infundibulopelvic ligament as follows: A silk ligature (*braided No. 2*) threaded on a small full-curved Hagedorn needle is passed twice through the infundibulopelvic ligament at the outer edge of the ovary and then carried through the peritoneum and underlying structures above the pelvic brim in

FIG. 521.

FIG. 522.

CONSERVATIVE OPERATIONS ON THE OVARIES.
Showing the operation for prolapse of the ovaries.

front of the external iliac artery. The ligated portion of the ligament is then brought in contact with the lateral pelvic wall and the free ends of the ligature tied. The ovary is thus raised out of the pelvic cavity and held permanently at its normal level in the pelvis.

CHAPTER XXIX.

THE URETHRA.

METHODS OF EXAMINATION.

The urethra can be examined by the following methods:

Direct inspection.
Palpation.
Urethroscopy or Indirect inspection.
Sounding.
Microscopic and Bacteriologic examinations.

DIRECT INSPECTION.

Limitations.—By direct inspection without the aid of instruments we can examine the external meatus, the lower portion of the urethral canal, its entire course under the anterior vaginal wall, and the openings of the glands of Skene.

Information.—The following conditions can be recognized by inspection:

External Meatus.—Inflammation, eversion of the mucous membrane, benign and malignant tumors, discharges from the canal, and infection of the glands of Skene.

Anterior Vaginal Wall.—Tumors, cysts, dilatations, or sacculations and suburethral abscesses.

Preparation of the Patient.—The patient requires no preparation whatever, and as a matter of fact the parts should not be cleansed nor douched nor the urine voided prior to the examination, because the discharges about the meatus

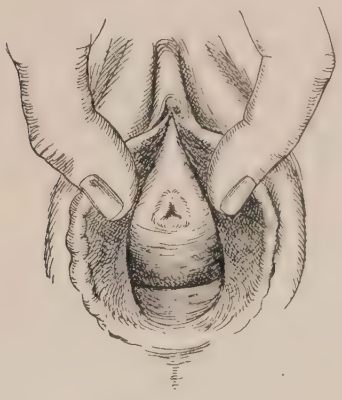


Fig. 523.

Fig. 524.

Direct Inspection of the Urethra.

Fig. 523 shows the external urinary meatus, being exposed with the thumb and index-finger; Fig. 524 shows forcing a discharge out of the urethra by pressure against the canal with the tip of the finger in the vagina.

would thus have been washed away and a correct idea of the conditions in some cases could not be obtained.

Position of the Patient.—The examination should be made in the dorsal posture.

Technic.—After placing the patient in the dorsal position the examiner

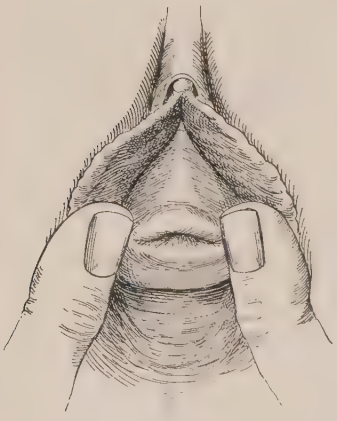


Fig. 525.

Fig. 526.

Direct Inspection of the Urethra (page 584).

Fig. 525 shows the orifice of the external meatus being stretched open with the thumbs; Fig. 526 shows the posterior vaginal wall being retracted with the index-finger so as to expose the anterior wall of the vagina.

sits or stands in front of the vulva and exposes the external urinary meatus by separating the nymphæ with the thumb and index-finger.

He then inspects the urethral opening and notes the presence or absence of abnormal conditions or discharges. To make sure that a purulent urethritis

does not exist the canal is milked toward the meatus by pressure through the vagina against the symphysis, from above downward, along the whole length of the urethra. The secretions in the middle and upper portion of the urethra are thus forced into view and can be carefully inspected.

Having thoroughly examined the meatus, he then exposes the lower end of the urethra and the orifices of the glands of Skene, which are situated posteriorly just inside of the urethral opening, by stretching the mouth of the urethra with the index-fingers or the thumbs. And, finally, the index-finger is passed into the vagina and its posterior wall pulled back so as to expose the portion of the anterior wall under which the urethra lies. The entire length of the canal can thus be inspected and abnormal conditions noted (Figs. 525 and 526).

PALPATION.

Limitations.—We can palpate the external meatus, the lower portion of the urethral canal, and its entire course under the anterior vaginal wall.

Information.—The following conditions can be recognized by palpation:

External Meatus.—Inflammation and urethral caruncles, cancerous infiltrations about the meatus, and neoplasms or other pathologic affections can be thoroughly palpated and their consistency, sensitiveness, and general characteristics noted.

Anterior Vaginal Wall.—The outline, consistency, mobility, and sensitiveness of the whole urethral canal can be examined and pathologic changes

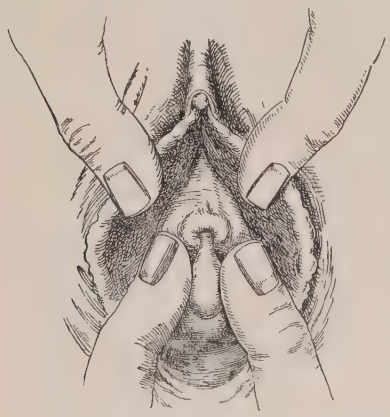


FIG. 527.

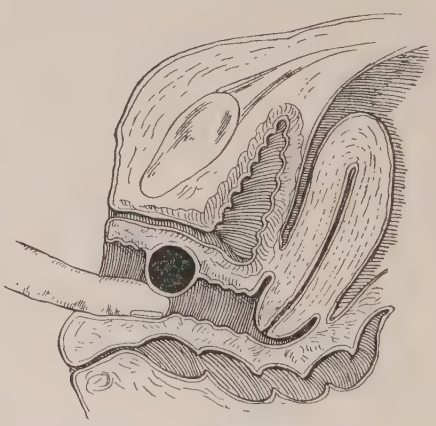


FIG. 528.

PALPATION OF THE URETHRA.

Fig. 527 shows a urethral tumor being palpated between the thumb and index-finger; Fig. 528 shows the urethral canal being palpated through the vagina by the index-finger. The illustration demonstrates the presence of a urethral tumor by vaginal palpation.

recognized. We may thus determine the presence of urethritis, benign and malignant neoplasms, cysts, dilatations of the canal, and periurethral inflammation or abscesses.

Preparation of the Patient.—Same as for Inspection.

Position of the Patient.—Dorsal posture.

Technic.—After placing the patient in the dorsal position the examiner sits or stands in front of the vulva and exposes the meatus. He then palpates the urethral opening and the lower end of the canal with the tip of the index-finger by pressing upward against the symphysis and notes any abnormal changes that

may be present. If a neoplasm is located at the urethral opening, it should be palpated between the thumb and the index-finger and its consistency and sensitiveness noted.

Having thoroughly examined the meatus the index-finger is then inserted into the vagina and the whole length of the urethra palpated by gently stroking the canal and rolling it about in various directions while making pressure upward against the symphysis. By thus manipulating the anterior wall of the vagina the examiner can recognize the physical characteristics of pathologic conditions that may be present and elicit valuable information as to their nature.

URETHROSCOPY OR INDIRECT INSPECTION.

Limitations.—The interior of the urethral canal can be inspected from the vesico-urethral juncture to the external meatus by means of a urethroscopic examination.

Information.—By this method of examination we are able to determine with accuracy the presence of inflammation, tumors, and other pathologic conditions situated within the urethral canal. The opening through which a suburethral abscess discharges its pus into the urethra can be seen, and we can also definitely locate the lesion in cases of vesico-urethral fissure.

Preparation of the Patient.—The urine must be voided naturally just before the patient is examined.

When the patient is placed on the table, the meatus and the vulva must be thoroughly sterilized to prevent infection being carried into the bladder. This is

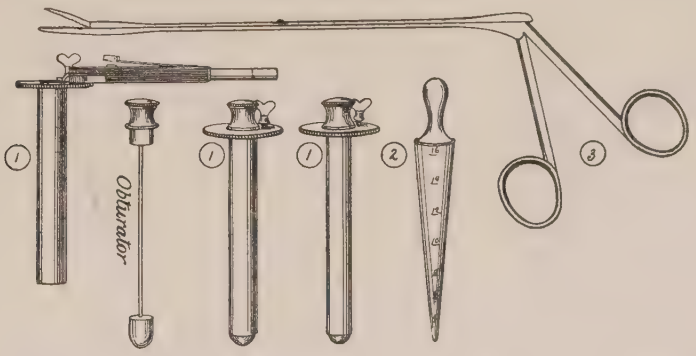


Fig. 529.—Instruments for Urethroscopy or Indirect Inspection of the Urethra.

accomplished by scrubbing the parts with a gauze sponge saturated with tincture of soap and warm water, and washing them with a solution of corrosive sublimate (1 to 2000), which in turn is removed by douching with sterile water or normal salt solution.

Position of the Patient.—Dorsal posture.

Instruments.—(1) The Ashton-Gans urethroscopes (three sizes—Nos. 24, 30, and 36 French scale); (2) Kelly's cone-shaped urethral dilator; (3) long delicate alligator-jaw forceps.

The Urethroscope.—This apparatus consists of a cylindric metal tube three inches long with a round flat flange at its proximal end, to which is attached a screw-post for securing the electric light attachment and an obturator which is used to facilitate the introduction of the instrument. The electric light carrier consists of a delicate cold lamp (from two to four volts) at the end of a slender

tube which is connected with a handle having a push-button to turn on the current. The lamp lies free and exposed in the lumen of the urethroscope and takes up no space and interferes in no way with the manipulations through the instrument. The battery consists of four dry cells which are enclosed in a box and connected by a rheostat.

The urethroscope is a modification which Dr. S. Leon Gans and I made of Valentine's original male endoscope, and was manufactured for us by Charles Lentz & Sons of Philadelphia. The instrument is superior in every way to any other urethroscope I know of, and is simple in construction, easily sterilized, affords a wide range of vision, and the necessary manipulations can be made through it with the greatest ease and certainty. I employ the instrument not only as a urethroscope, but also as a cystoscope, in all cases requiring

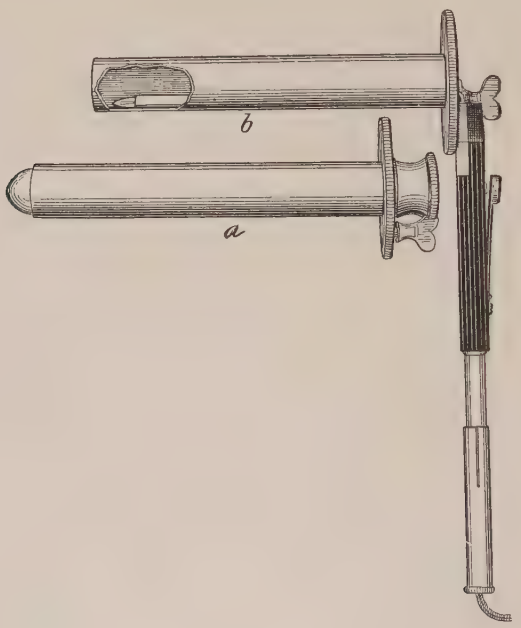


FIG. 530.—THE ASHTON-GANS URETHROSCOPE.
Illustration *a* shows the obturator within the cylindric tube; illustration *b* shows the electric-light carrier attached to the tube.

an examination or treatment of the bladder and the ureters. The advantages of an electric lamp at the distal end of the urethroscope are self-evident and are in strong contrast with the unsatisfactory nature of an examination when a reflected light is used to illuminate the urethra or bladder.

The Urethral Dilator.—Kelly's cone-shaped urethral dilator is a metallic instrument with a round point which gradually increases in size until it becomes 16 millimeters at its base. The instrument is graduated so that the examiner can determine when the required degree of dilatation is reached. The external urinary meatus is the only part of the urethral canal that requires dilatation, as the

rest of the canal is very dilatable and readily stretched by the urethroscope.

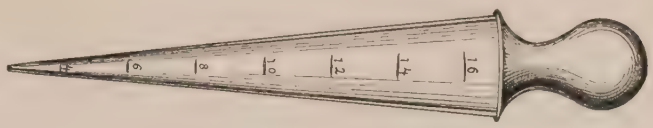


FIG. 531.—KELLY'S CONE-SHAPED URETHRAL DILATOR.

The Alligator-jaw Forceps.—This instrument is used to hold small balls of absorbent cotton which are employed to wipe the secretions from the urethra and expose the mucous membrane.

FIG. 532.—ALLIGATOR-JAW FORCEPS.
The handles which are not shown are bent at an angle so as not to obstruct the view (Fig. 529).

Sterilization of the Instruments.—The *urethroscopes*, the *urethral dilator*, and the *alligator-jaw forceps* are boiled for five minutes in a soda solution, and the *light-carrier*, which includes the lamp and slender connecting tube, is immersed for ten minutes in a 3 per cent. solution of carbolic acid. The handle of the light-carrier is wrapped in sterile gauze, as it cannot be placed in an antiseptic solution without injuring its connection.

Absorbent Cotton and Liquid White Vaselin.—Small pledgets of absorbent cotton must be on hand to remove discharges from the urethral canal and one ounce of liquid white vaselin for lubricating the dilator and urethroscopes. Liquid white vaselin does not coat nor change the appearance of the mucous membrane, and is therefore preferable to other lubricating materials for urethroscopic and cystoscopic examinations. It is sterilized in the same manner as liquid soap (see p. 814).

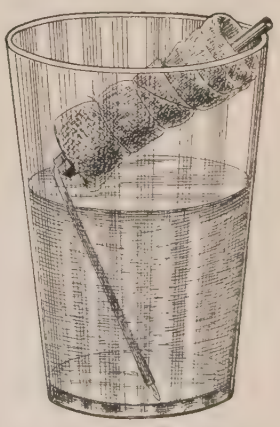


FIG. 533.—METHOD OF STERILIZING THE LIGHT-CARRIER AND LAMP OF THE URETHROSCOPE.
An ordinary glass tumbler partially filled with the antiseptic solution is used. Note the sterile gauze wrapped around the handle of the light-carrier.

Rubber Gloves.—The examiner should wear rubber gloves to guard against the possibility of contaminating the instruments and carrying infection into the bladder.

Anesthesia.—A general anesthetic is not required unless the patient is nervous or very sensitive to pain, and the examination can therefore usually be made under the local effect of cocain. A pledget of cotton is saturated with a 10 per cent. solution of cocain and placed in the lower urethra for five minutes before the examination.

Technic.—After dilating the meatus to the required extent the obturator is placed in the urethroscope and the instrument passed directly into the bladder (Figs. 534 and 535).

The obturator is then withdrawn, the light-carrier attached to the urethro-

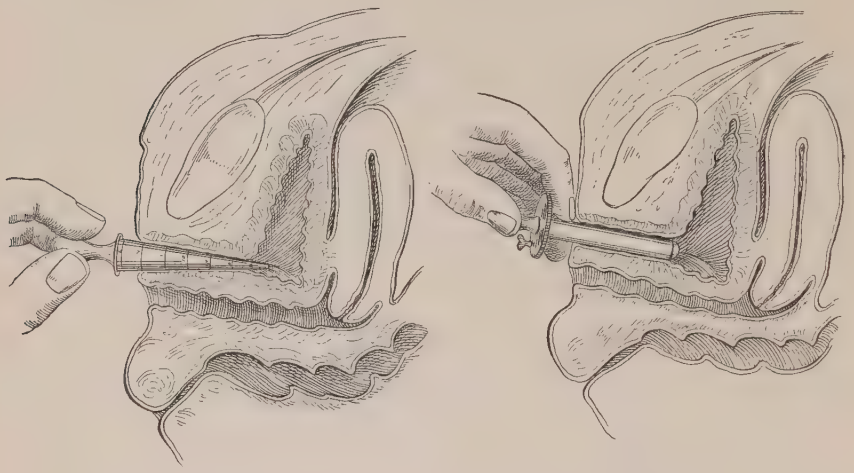


FIG. 534. FIG. 535.

URETHROSCOPY OR INDIRECT INSPECTION OF THE URETHRA (page 587).

Fig. 534 shows the method of introducing the urethral dilator; Fig. 535 shows the method of introducing the urethroscope. Note the pose of the fingers and thumb.

scope, and the handle connected with the battery. The current is then turned on by pressing the button in the handle and the examiner looks through the urethroscope into the bladder. The instrument is then gradually withdrawn and the vesico-urethral juncture carefully examined when it comes into view. Continuing to slowly withdraw the urethroscope, the examiner observes the appearance of the mucous membrane as it closes over the distal end of the instrument and notes the pathologic changes present.

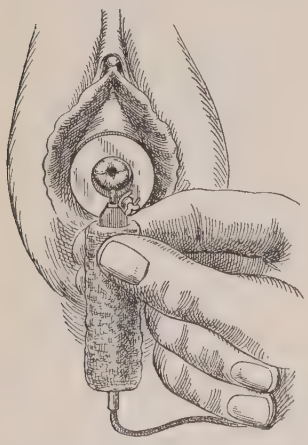


FIG. 536.—URETHROSCOPY OR INDIRECT INSPECTION OF THE URETHRA.

Showing the urethral mucous membrane closing over the distal end of the urethroscope as it is slowly withdrawn from the urethra.

SOUNDING.

Limitations.—The meatus and the entire length of the canal can be explored with a sound.

Information.—By sounding the urethra we can distinguish between a growth situated at the meatus and an eversion of the mucous membrane, locate obstructions due to strictures, neoplasms, or impacted calculi, and also recognize sacculations and dilatations of the canal.

Preparation of the Patient.—Same as for urethroscopy.

Position of the Patient.—Dorsal posture.

Instruments.—(1) A slightly curved bladder sound; (2) a set of steel *bougies à boule.*

Antisepsis.—The instruments are boiled for five minutes in a solution of soda. Rubber gloves should be worn and liquid white vaselin used as a lubricant.

Anesthesia.—An anesthetic is not required.

Technic.—After placing the patient in the dorsal position the examiner

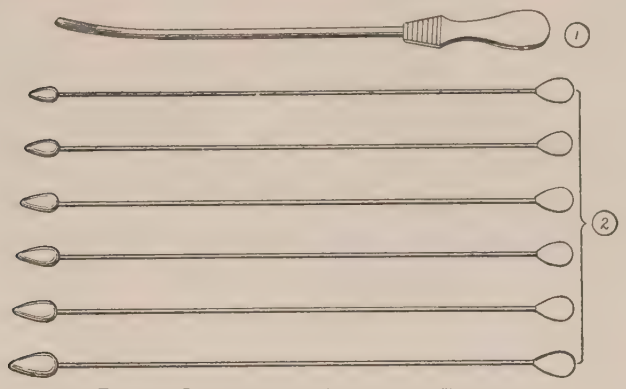


FIG. 537.—INSTRUMENTS FOR SOUNDING THE URETHRA.

sits in front of the vulva and exposes the meatus. The urethra is then explored with the curved bladder sound by guiding its tip in the normal direction of the canal. If the sound enters the bladder without meeting with resistance, we can exclude the presence of a stricture, a neoplasm, or a calculus; if, however, an obstruction is met, its nature should be carefully studied and an attempt should be made to pass it with a smaller instrument.

With a bougie à boule we can determine the proximal as well as the distal end of the obstruction and thus estimate its extent (Figs. 539 and 540). An impacted stone can be recognized by hearing and touch when the tip of the sound strikes against the obstruction.

If the sound is snugly grasped by the urethra while it is being introduced, there can be no dilatation of the canal; but if the instrument moves about freely as in a cavity larger than its own diameter, the caliber of the organ is abnormally increased. In cases of urethrocele by rotating the tip of the sound downward into the sacculation the point of the instrument can be seen and felt through the anterior vaginal wall (Fig. 567).

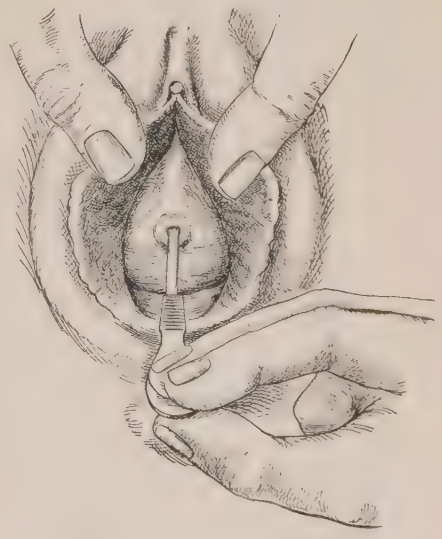


FIG. 538.—SOUNDING THE URETHRA.
Showing the method of introducing a curved bladder sound into the urethra.

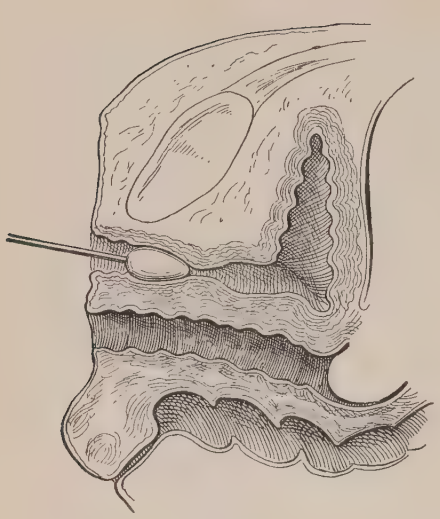


FIG. 539.

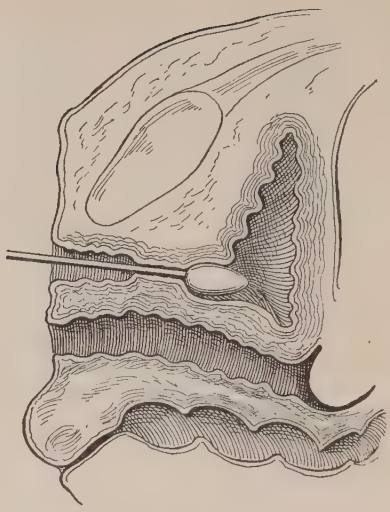


FIG. 540.

SOUNDING THE URETHRA (page 589).

Fig. 539 shows a bougie à boule obstructed by the proximal end of a stricture; Fig. 540 shows the withdrawal of the instrument obstructed by the distal end of the constriction.

MICROSCOPIC AND BACTERIOLOGIC EXAMINATIONS.

Limitations.—These methods of investigations are limited to the examination of urethral discharges.

Information.—We can determine the character of the infection in cases of inflammation of the urethra.

Technic.—The methods of obtaining and preserving urethral discharges for a subsequent microscopic or bacteriologic examination are fully described in Chapter II.

MALFORMATIONS OF THE URETHRA.

The following anomalies of the urethra have been noted:

Complete or partial absence of the urethra.
Atresia of the urethra.
Hypospadias.
Epispadias.

Complete or Partial Absence of the Urethra.—*Complete absence* of the urethra is an exceedingly rare condition and usually occurs in that form of persistent cloaca in which the bladder, the vagina, and the gut open into one common receptacle. In some cases, however, the rectum terminates normally at the anus and the bladder opens directly into the vagina by a transverse slit through which the urine constantly dribbles unless the opening is sufficiently closed to allow a certain amount of accumulation to take place before incontinence occurs.

Partial absence of the urethra may involve either the proximal or distal end of the canal; if the former is absent, the bladder opens directly into the vagina and incontinence results; but if the latter part only is wanting, the patient has perfect control over the contents of the bladder and the stream of urine is diverted into the vagina.

Treatment.—Absence of the lower portion of the urethra requires no treatment, as the patient has perfect control of the bladder. If, however, there is complete absence or the upper portion of the urethra is involved, an effort should be made to form a new urethral canal by means of a flap operation and the vesico-

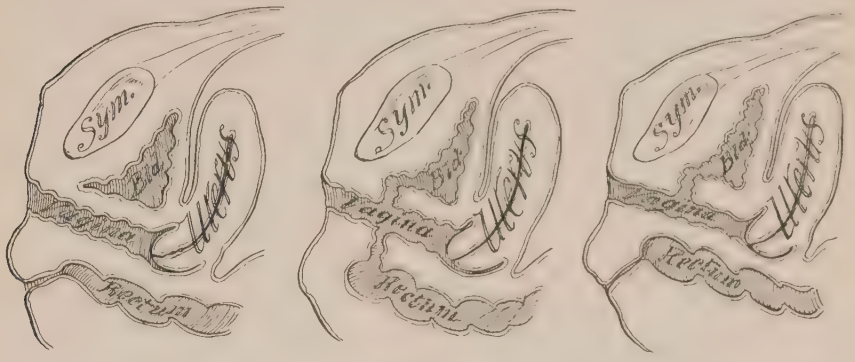


Fig. 541. Fig. 542. Fig. 543.

Complete Absence of the Urethra.

Fig. 541 shows an absence of the urethra without any other malformation; Fig. 542 shows an absence of the urethra associated with a cloaca; the rectum and bladder emptying into the vagina; Fig. 543 shows an absence of the urethra with a normal rectum and the bladder communicating with the vagina.

vaginal opening subsequently closed in the same manner as described elsewhere in cases of acquired fistulas.

Atresia of the Urethra.—In some cases the entire urethral canal may be imperforate; in others only a portion may be involved; and, finally, the

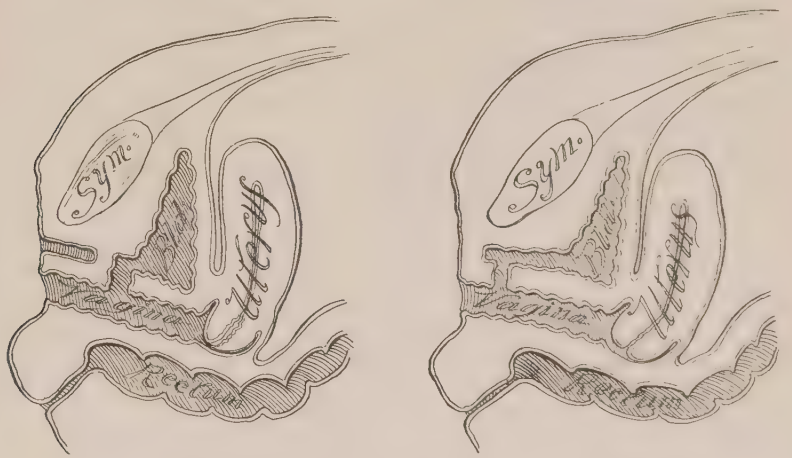


Fig. 544. Fig. 545.

Partial Absence of the Urethra.

Fig. 544 shows an absence of the proximal end of the urethra and the bladder emptying into the vagina; Fig. 545 shows an absence of the distal end of the urethra and the opening through which the stream of urine is diverted into the vagina at the time of urination.

obstruction may be due to a thin membranous septum, which is usually stretched across the urethra near the neck of the bladder (Fig. 546).

Atresia results in retention of urine, and the bladder, the ureters, and the

kidneys may become so distended that paracentesis must be performed before the fetus can be delivered. In some cases, however, the urine is discharged at the umbilicus through a patulous urachus and distention of the urinary organs does not take place.

Treatment.—Complete atresia, as a rule, results fatally to the child during intrauterine life, but if, however, it should happen to be born alive, an artificial vesicovaginal fistula must be made at once to give exit to the urine. In cases of atresia involving the distal end of the urethra an artificial urethrovaginal fistula should be made just beyond the obstruction; but if the proximal portion is affected, an opening must be made between the bladder and the vagina, which may be closed later on if it is possible to form a new urethra by means of a flap operation. A membranous septum should be punctured with a small trocar and kept dilated until the raw edges have completely healed.

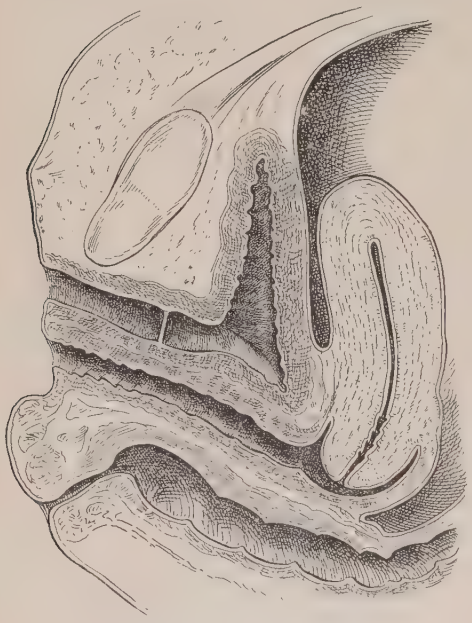


FIG. 546.—ATRESIA OF THE URETHRA (page 591). Showing a thin membranous septum near the bladder.

Hypospadias.—This is a deficiency, varying in degree, of the floor of the urethra, the effect being that the canal opens at a higher level than normal. It is due to defective development of the wall of the urogenital sinus. If the deficiency in the floor of the urethra involves the vesicovaginal juncture, incontinence results; but if it only affects the distal portion of the canal, the patient has entire control of her bladder and the only inconvenience is that which is due to the abnormal direction given to the stream of urine during micturition.

Treatment.—If the neck of the bladder is involved and there is incontinence, an effort should be made to restore the floor of the urethra by denuding the adjacent mucous membrane and uniting the raw surfaces with sutures. If, however, the patient has complete control of her urine, there is but little or no inconvenience, and nothing need therefore be done to remedy the defective condition.

Epispadias.—This is an anomaly by defect in the ventral wall or roof of the urethra. There may be an accompanying cleft condition of the clitoris, or it may be associated with exstrophy of the bladder. Incontinence of urine may or may not be present.

Treatment.—If the defect of the urethra cannot be remedied by a plastic operation in cases in which the patient has no control of the bladder, nothing can be done beyond wearing an ambulatory urinal and keeping the parts scrupulously clean.

DISEASES OF THE URETHRA.

URETHRITIS.

Causes.—The disease is not nearly so common in women as in men. In a very large majority of the cases the affection is specific in origin and is caused by a gonorrheal infection which is also usually present in the vulva and in other parts of the genital canal.

The *non gonorrheal* forms of the disease are due to the following causes:

Inflammation of the bladder.
The tubercle bacillus, syphilis, and erysipelas.
Traumatism, especially in childbirth; passage of a calculus; and rough instrumentation.
Irritating vaginal discharges.
Urethral neoplasms.

Symptoms.—In the *gonorrheal form* of urethritis the disease begins with a sensation of itching in the urethra which lasts for one or two days and is followed by burning and pain upon urination. As the inflammation progresses the symptoms become more intense and the desire to void urine is usually increased in frequency. When the inflammation begins to subside, the symptoms gradually lessen in intensity, and eventually they disappear entirely if a cure is established. If, however, the disease passes into a subacute or chronic state, the symptoms are not completely relieved and the patient may complain of some soreness in the urethra and slight frequency in voiding urine. Chronic infection of the glands of Skene does not, at a rule, give rise to local discomfort, and there is no pain during urination.

In the *non-gonorrheal forms* of urethritis the symptoms are less severe and the disease runs a shorter course.

Physical Signs.—After the disease becomes established the external meatus is inflamed and swollen and the urethral mucous membrane is somewhat prolapsed. A purulent discharge is seen at the mouth of the urethra and the openings of Skene's glands appear as small, ovoid, yellowish spots surrounded by a zone of deep congestion. If no pus is found at the meatus it may be expressed from the canal by pressure with the finger upon the urethra through the vaginal wall. In the same way pus may be pressed out of the ducts of Skene's glands and the presence of the disease demonstrated in these structures.

The urethra is found to be tender upon pressure and the canal feels indurated and cord-like to the examining finger.

The local signs of inflammation entirely disappear if the disease is cured; but if the affection becomes subacute or chronic, there is a slight purulent discharge, some pouting of the urethral mucosa, and slight soreness upon pressure over the urethra.

In *acute cases* the urethroscope reveals a reddened and swollen condition of the entire urethral mucosa, but in the *chronic forms* of the disease there is little or no swelling and small ulcers or granular patches are often seen scattered over the mucous membrane.

The microscope will demonstrate the presence or absence of gonococci in the pus which is taken from the urethra or the glands of Skene.

Prognosis.—*Gonorrheal* urethritis is a very difficult condition to cure on account of the frequency with which the gonococci permanently intrench them

selves in the glands of Skene. The prognosis of the *non-gonorrheal forms* of the disease depends upon their cause.

Treatment.—The treatment of the disease depends upon the stage of the inflammation and may be divided into: (1) Acute cases and (2) chronic cases.

Acute Cases.—The treatment is divided into (1) the general and (2) the local.

General Treatment.—Under this heading are included rest, diet, drink, internal medication, and general and local baths.

Rest.—Rest is one of the most important factors in the treatment of the disease, and if the circumstances of the patient will permit, she should be kept in the recumbent position, preferably in bed. If this cannot be accomplished, she should be given careful instructions to avoid all unnecessary forms of exercise, such as walking, standing, or lifting, and to lie down on a lounge for ten or fifteen minutes at a time whenever it is convenient to do so.

Diet.—The diet must be carefully regulated. In the treatment of acute urethritis it is impossible to emphasize too strongly the importance of selecting those articles of food that have the effect of rendering the urine bland and unirritating to the inflamed urethral mucous membrane. For this purpose no article possesses the advantages of skimmed milk, and if possible the patient should be restricted to its use during the early stages of the disease while the inflammation is acute and the pain upon urination is severe. Unfortunately many patients object to an absolute milk diet, and we are therefore obliged to allow them other articles of food, which must be, however, of a non-stimulating and easily digested character. The following articles must be avoided: All highly seasoned foods; meats of all kinds; greasy or fried foods; coffee or tea; salt, pepper, or vinegar; acid fruits or vegetables; and asparagus.

Drink.—The drink of the patient must be carefully selected and alcohol in all forms prohibited. The kidneys should be kept active and the urine diluted by drinking two or three quarts of distilled water daily; if, however, this water cannot be obtained, we should use a natural spring-water containing a minimum amount of earthy matter (see p. 101). Apollinaris, soda, and seltzer waters are also useful and beneficial in these cases.

Internal Medication.—Internal medication is important in cases of urethritis to relieve the local inflammation and render the urine innocuous. The bowels should be kept regularly and freely flushed with salines; rectal enemata are contraindicated on account of the danger of infecting the rectum. If the urine is acid, beneficial results are obtained from drinking alkaline mineral waters and the internal administration of the salts of potassium; if it is alkaline, ammonium benzoate, salol, and boric acid are indicated alone or combined with the infusion of buchu or uva ursi. Cubebs, copaiba, and the oil of sandalwood possess marked curative properties in cases of urethral inflammation, and they should therefore be given as a routine practice alone or in combination.

General and Local Baths.—General and local baths have a sedative and curative effect upon the disease. The pain upon urinating, the tenderness, and the intensity of the inflammation are decidedly relieved by the application of hot water. Under these circumstances the patient should be instructed to take a full hot bath (see p. 83) at bedtime, and also a hot sitz-bath (see p. 87) once or twice during the day. A medicated vaginal douche containing bichlorid of mercury (1 to 2000), followed by an injection of normal salt solution or plain water, should be given before the full hot bath at bedtime and also in the morning after getting up.

Local Treatment.—The specific nature of the vast majority of the cases of acute urethritis must not be lost sight of, and hence the indication is to destroy the gonococci at once by direct medication to the urethral canal.

The following articles are required: (1) Kelly's surgical rubber pad; (2) Skene's reflux urethral catheter; (3) fountain syringe; (4) Skene's bivalve urethral speculum; (5) applicator; (6) absorbent cotton; (7) a solution of argyrol (20 per cent.); (8) a solution of cocain (10 per cent.).

Technic.—The local treatment is carried out as follows:

1. The patient is placed in the dorsal position and the surgical pad arranged under her hips.

2. The vagina is then douched with a solution of corrosive sublimate (1 to 2000) followed by normal salt solution.

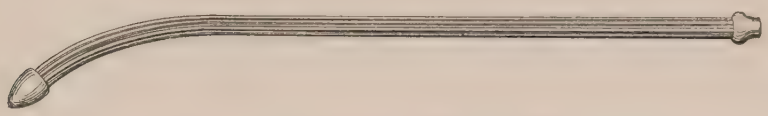


Fig. 547.—Skene's Reflux Urethral Catheter.

3. The solution of cocain is now applied to the urethra on an applicator wound with cotton and allowed to remain for five minutes.

4. The reflux catheter is then introduced into the urethra and the canal flushed with a pint of hot normal salt solution.

5. The speculum is now introduced as far as the internal meatus and the applicator, which is wound with cotton and saturated with the argyrol solution, passed into the canal. The speculum is then removed and the applicator slowly withdrawn from the urethra.

The above treatment should be given daily and continued until the disease is cured or it shows a tendency to become chronic.

The reflux catheter should not be passed beyond the internal meatus, otherwise there is danger of carrying the infection into the bladder, and, besides, the instrument in that position will not flush the urethra.

When the purulent character of the discharge lessens or disappears, it is often advisable to discontinue the use of argyrol and substitute one of the following

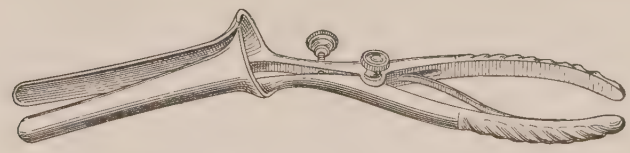


Fig. 548.—Skene's Bivalve Urethral Speculum.

astringents, a pint solution of which should be injected daily into the urethra with the reflux catheter: Tannic acid, gr. x to f℥j; sulphate of zinc, gr. j or ij to f℥j; acetate of zinc, gr. x to f℥j; acetate of lead, gr. ij to f℥j; or a 50 per cent. solution of hydrogen peroxid.

Chronic Cases.—The treatment may be conveniently divided into: (1) the general and (2) the local.

General Treatment.—The general treatment of chronic specific urethritis is a secondary consideration, and there is but little to suggest beyond keeping the urine bland and unirritating by the means already described and looking after the digestion and the nutrition of the patient.

Local Treatment.—The local treatment, on the other hand, is all-important, as the inflammation may continue indefinitely and subsequently infect other parts of the genito-urinary tract or transmit the disease to the male urethra.

As stated above, the lesions in chronic urethritis manifest themselves as small ulcers or granular patches scattered over the urethral mucous membrane, or as a purulent discharge from the glands of Skene. These conditions often exist together, but it is not uncommon, however, to find that a small drop of pus may be expressed from the ducts of Skene's glands after the urethral mucosa has been restored to a normal state, showing that the infection may be intrenched in these structures without giving rise to any subjective symptoms.

Chronic cases of urethritis where no lesions are observed beyond a general subacute inflammation of the urethral mucosa are treated as follows: (1) Cocainize the urethra in the manner described above. (2) Paint the entire canal with a solution of nitrate of silver (gr. ij–f℥j), using the urethral speculum and the applicator wound with cotton as recommended in applying argyrol.

The above treatment should be given once or twice a week and continued until the discharge entirely disappears.

Granular patches and small ulcers are treated as follows: (1) Cocoainize the urethra. (2) Introduce a urethroscope up to the internal meatus. (3) Take an applicator wound with cotton, dip it into a solution of nitrate of silver (gr. xxx to f℥j), and touch each patch or ulcer. This application should be repeated once a week until the lesions disappear.

Chronic inflammation in Skene's glands is treated as follows: (1) Dilate the external meatus. (2) Introduce a probe and slit each duct open on the urethral surface. (3) Cauterize the raw surfaces with a Paquelin cautery, pure carbolic acid, or the solid stick of silver nitrate.

STRICTURE.

Causes.—Stricture of the urethra is a rare occurrence and it is not nearly so common in women as in men. The condition may be due to a cicatricial contraction of the tissues of the urethra resulting from a previous ulceration or it may be caused by narrowing of the lumen of the canal by a neoplasm or a periurethral infiltration.

The following are the chief causes:

Gonorrheal urethritis; chancre; chancroid; and tuberculosis.
Traumatism resulting from childbirth or from operations on the urethra.
Caustic applications to the urethra.
Malignant disease of the urethra.
Urethral tumors.
Adjacent malignant disease causing periurethral infiltration.

Description.—A stricture due to cicatricial contraction is usually localized and involves the entire circumference of the canal. It may be situated at any part of the urethra from the internal to the external meatus, and in rare cases the whole canal may be narrowed. The largest number of these strictures are situated at or near the external meatus.

Strictures due to urethral tumors, to malignant disease, and to periurethral infiltrations are, as a rule, very extensive and affect the entire length of the canal.

Symptoms.—The most common symptom is frequent and difficult micturition, which increases in severity as the constriction in the urethra becomes more marked. In rare instances the patient complains of incontinence of urine, and in others the stricture may so completely occlude the canal as to cause retention. We should always bear in mind that the *incontinence of retention* which is observed in the male may also occur in cases of urethral stricture in the female.

Physical Signs.– The presence of the stricture is revealed by (1) palpation, (2) the use of the sound, and (3) the urethroscope.

The induration about the site of the stricture may usually be felt by palpating through the vagina along the course of the urethral canal. The stricture may also be located by the resistance or obstruction offered to the passage of a sound, and, finally, the lower portion of the constriction may be seen through an endoscope. If the stricture is located at or near the external meatus, it can generally be seen by direct inspection.

Prognosis.—The prognosis depends upon the cause. The removal of a urethral neoplasm is usually followed by a permanent cure, while malignant disease and periurethral infiltration are of course incurable. Strictures due to cicatricial contraction are very liable to recur after forcible dilatation unless the sound is subsequently passed at regular intervals, as in the male. A tight stricture at or near the meatus is likely to cause dilatation of the urethra from the backward pressure of the urine during the act of micturition, and cystitis, with subsequent infection of the ureters and kidneys, often results from the same cause.

Treatment.—The treatment of urethral neoplasms and malignant disease is discussed elsewhere.

In cases of cicatricial contraction the treatment is conveniently divided into the following methods:

Forcible dilatation.
Gradual dilatation.
Internal urethrotomy.
Making an artificial urethrovaginal fistula.

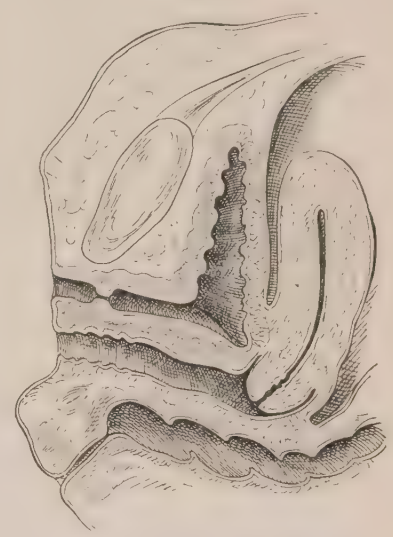


FIG. 549.—STRICTURE OF THE URETHRA.
Showing a stricture of the urethral canal near the meatus.

Forcible Dilatation.—This procedure is applicable in the majority of cases and is contraindicated only when the cicatricial tissue is so dense and extensive that dilatation cannot be performed without causing too much traumatism.

The dilatation should be done at one sitting, under an anesthetic, with the patient in the dorsal position, by means of Hegar's uterine dilators, beginning with a small instrument and increasing the size until the urethra is dilated to half an inch. An excessive or a too rapid dilatation must be carefully avoided, as the urethra may be torn and incontinence result (Figs. 550 and 551).

A dilator should be passed every three days for two weeks after the operation to keep the canal patulous. The urethra should be cocainized before using the instrument if the patient complains of much pain. Should the stricture subsequently show a tendency to contract, the patient should be taught to use the sound herself and given instructions to pass the instrument into the urethra once every month or six weeks for an indefinite length of time.

Gradual Dilatation.—This method is indicated when the patient refuses to take a general anesthetic or when the stricture is very limited in extent and situated near the external meatus.

The dilatation is accomplished by means of Hegar's uterine dilators, beginning with a small instrument and increasing the size every third day until the

urethra is stretched to the desired extent, which should not be beyond one-half of an inch. The urethra should be cocainized before passing the sound, as the instrumentation is nearly always accompanied with pain.

Fig. 550.

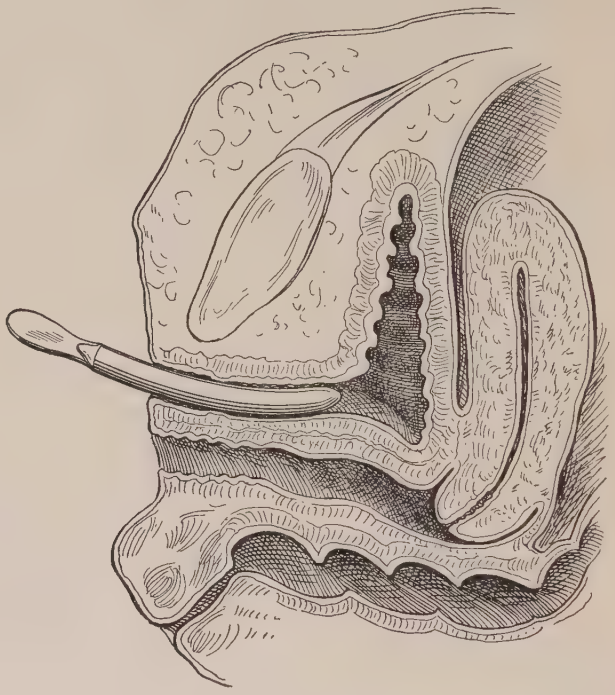


Fig. 551.

Forcible Dilatation of a Urethral Stricture (page 598).
Fig. 550, Hegar's dilator; Fig. 551 shows the method of dilating a urethral stricture.

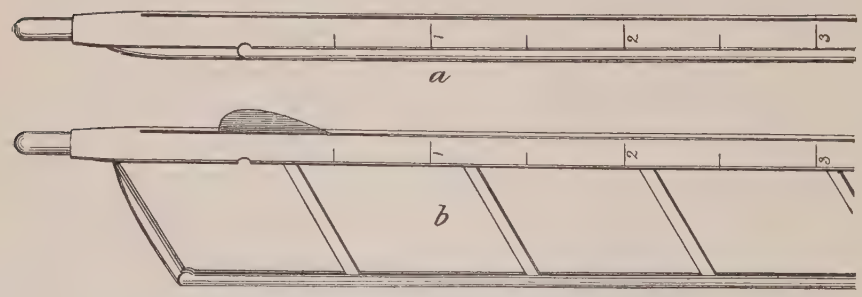


Fig. 552.—Distal End of Otis's Straight Dilating Urethrotome.
Illustration *a* shows the instrument closed; illustration *b* shows the dilating portion fully expanded and the knife exposed.

The subsequent treatment is similar to that of forcible dilatation.

Internal Urethrotomy.—Dense fibrous strictures should be treated by division with a knife or with a urethrotome such as is used in similar conditions in the male. A general anesthetic must be employed and the patient placed in the

dorsal position. After cutting the stricture the urethra should be thoroughly stretched with Hegar's uterine dilators.

The subsequent treatment is similar to that of forcible dilatation.

Making an Artificial Urethrovaginal Fistula.—If the stricture is situated in the distal end of the urethral canal and cannot be dilated nor cut, a new route

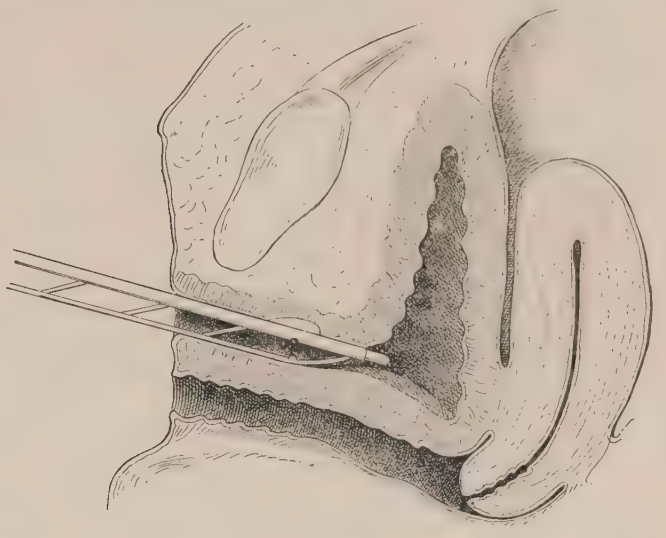


FIG. 553.—INTERNAL URETHROTOMY.
Shows the method of cutting a stricture with Otis's dilating urethrotome.

should be made for the urine between the urethra and the vagina. The urethral canal should be opened just behind the stricture, care being taken not to injure the bladder, and the mucosa of the urethra and the vagina united by interrupted catgut sutures to insure the permanency of the opening.

VESICO-URETHRAL FISSURE.

Definition.—A crack or fissure in the urethral mucous membrane which is situated near the internal meatus and extends into the bladder.

Causes.—The affection is due to an inflammation which eventually results in an irritable ulcer at the vesico-urethral juncture.

The chief causes are:

Gonorrheal urethritis.
Displacements of the bladder.
Injuries during confinement.
Unskilful instrumentation in the urethra.
Passage of vesical calculi.

Description.—About one-third of the fissure is situated in the bladder; the remaining two-thirds run lengthwise in the urethra at the bottom of one of the depressions formed by the longitudinal folds of mucous membrane (Fig. 554). The crack or ulcer may involve any part of the circumference of the urethral canal and it resembles somewhat an irritable fissure of the anus in its general appearance. It has a yellowish-gray base; indurated, abrupt, and inflamed

edges; and when put upon the stretch by a urethroscope it looks like a fresh bleeding tear in the mucous membrane.

Symptoms.—The symptoms of the affection are due to the situation of the lesion. If the fissure was located wholly within the urethral canal, it would cause only a slight burning sensation during urination; but as it also involves the base of the bladder, it is constantly irritated by the pressure and presence of urine and by the muscular contractions which occur at the vesico-urethral juncture during the act of micturition as well as the tenesmus which is such a prominent factor in these cases.

A vesico-urethral fissure is accompanied by a constant desire to void urine, severe tenesmus, a constant burning sensation at the neck of the bladder, and an acute pain during and immediately following urination. The pain is most intense after urination, and in many cases it becomes agonizing in character and is associated with a severe and distressing tenesmus. In a short time after urinating

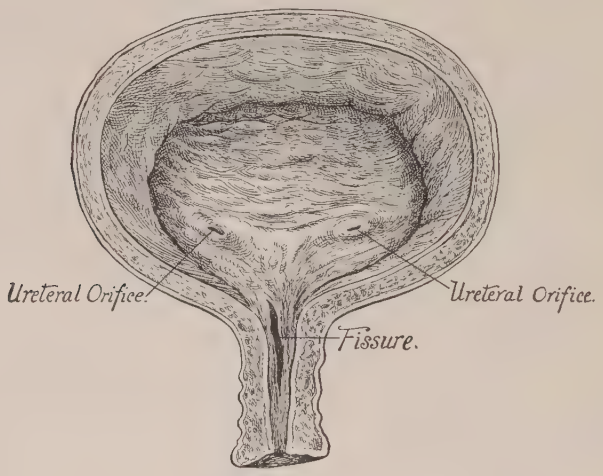


FIG. 554.—VESICO-URETHRAL FISSURE (page 599).

the pain subsides, although it never entirely disappears, and it returns again so soon as the urine collects in the bladder.

Physical Signs.—Pressure over the neck of the bladder through the vagina reveals a spot of circumscribed tenderness and causes a sharp, shooting pain. The fissure is readily seen through the urethroscope and the extent of the lesion determined.

Differential Diagnosis.—It is important that the disease should be distinguished from urethritis and cystitis, as there is a strong resemblance in the symptomatology of all three affections, and while vesico-urethral fissure is a comparatively rare condition, no excuse can be offered for overlooking the lesion. There is no doubt whatever that many cases of urethritis and cystitis are treated unsuccessfully because the presence of a coexisting vesico-urethral fissure has been overlooked.

Treatment.—The treatment of the affection is surgical and consists in the following procedures:

Divulsion of the vesico-urethral juncture.
Making an artificial vesicovaginal fistula.

Divulsion of the Vesico-urethral Juncture.—Forcible dilatation of the urethra results in a permanent cure in the majority of cases, and should always be the method of treatment first adopted.

The preparation of the patient is important, as it is necessary for the success of the operation that the urine should be bland and innocuous, so that it will not be a source of irritation while the fissure is healing. The patient should therefore be placed upon a restricted diet for a few days before the operation, and nothing is better under these circumstances than skimmed milk, along with other articles of food of a non-stimulating and easily digested character. Alcohol in all forms is prohibited and the patient should drink two or three quarts of distilled water daily. The natural spring-waters (see p. 101) containing a minimum amount of earthy matter, and soda, apollinaris, or seltzer water are also beneficial. The bowels should be kept regular with salines, and if the urine is acid the salts of potassium should be administered, but if it is alkaline, ammonium benzoate, salol, or boric acid is indicated alone or in combination.

The operation is performed under an anesthetic with the patient in the dorsal position by means of Hegar's uterine dilators, beginning with a small instrument and increasing the size until the urethra is dilated to the extent of half an inch.

The patient should remain in bed for one week; there is no necessity for a subsequent dilatation.

Making an Artificial Vesicovaginal Fistula (*Vaginal Cystotomy*, page 970).—Should divulsion of the urethra fail to effect a cure, an artificial vesicovaginal fistula should be made immediately after performing a secondary forcible dilatation. The vaginal and vesical mucosa are not united by sutures and the false opening usually closes spontaneously by the time the fissure is healed.

The bladder should be washed out daily with a quart of boric acid solution (gr. xv to f℥j) by passing the nozzle of the irrigating apparatus through the fistulous opening and allowing the fluid to drain away by the same channel.

PROLAPSE.

Definition.—By prolapse of the urethra we mean an eversion or turning out of the urethral mucous membrane through the opening of the external meatus.

Causes.—The normal urethral mucosa cannot become everted, but if it becomes relaxed or hypertrophied or its attachments become loosened, prolapse is likely to result and the membrane protrudes through the external urinary opening.

We commonly find more or less eversion or pouting of the mucosa in women who have borne several children, which has no pathologic significance whatever; but it is a rare occurrence to meet a prolapse which forms a well-marked protrusion beyond the external meatus.

The affection is usually seen in old and debilitated women; in young children of a strumous diathesis; and in girls who are poorly nourished and chlorotic.

Prolapse may result from a difficult labor in which the urethra is torn and separated from its attachments; from a severe urethritis associated with marked swelling of the mucous membrane; from overdilatation of the urethral canal; and from traction exerted by a tumor or a polypus. Sometimes the lesion may be caused by vesical tenesmus and is associated with cystitis, vesico-urethral fissure, stone, or a bladder tumor. Again, severe attacks of coughing may be the exciting cause, and, finally, the eversion may be due to the acute rectal tenesmus which results from an anal fissure or hemorrhoids.

Description.—The size and extent of the eversion vary greatly. Sometimes only one portion of the urethra is involved and in other cases the whole circumference of the canal is implicated. In women, as a rule, only the lower por-

tion of the urethral mucous membrane is affected, but in children the upper part of the canal is involved as well, and consequently the tumor is usually larger.

If the entire circumference of the canal is prolapsed, the mucous membrane protrudes from the external meatus as a dark congested mass, in the center of which is the opening into the urethra; when, however, the eversion is limited to one portion, it presents itself as a small tumor which is apparently attached to the margin of the urinary opening and which resembles a caruncle in appearance. If the meatus does not cause constriction, the mucous surface of the everted mass is but little changed at first; but later on it becomes swollen, inflamed, and edematous from local irritation, and in time the tumor becomes sensitive, its surface is excoriated, and it bleeds readily upon touch. As the edema increases the tumor becomes more and more constricted by the meatus, and in some cases strangulation may occur and the entire mass may be thrown off as a slough.

Symptoms.—The symptoms closely resemble those of an irritable growth at the external meatus, such as a caruncle or an inflamed polypus. The patient therefore complains of frequent and painful urination. The frequency of micturi-

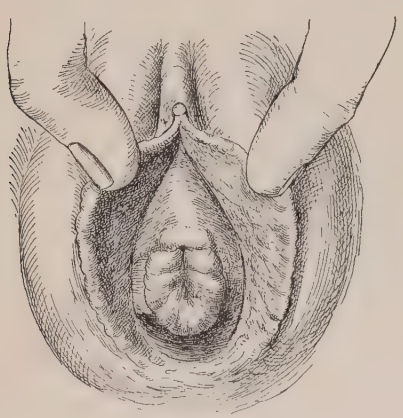


FIG. 555.

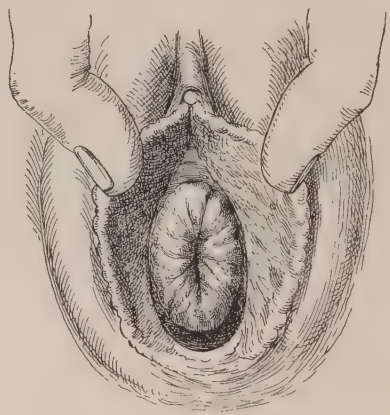


FIG. 556.

PROLAPSE OF THE URETHRAL MUCOUS MEMBRANE.

Fig. 555 shows a prolapse of the lower half of the urethra; Fig. 556 shows a prolapse of the entire circumference of the urethral canal.

tion is due to cystitis which often accompanies the affection, and the pain is accounted for by the presence of urethritis and the sensitive condition of the prolapsed mucosa. The local pain and tenderness are sometimes so marked that they may interfere with walking and also render coitus impossible.

Diagnosis.—The diagnosis is based upon the physical appearance and the situation of the tumor.

When the prolapse involves the whole circumference of the canal, the presence of the opening of the urethra in its center establishes the diagnosis. If only one portion is implicated, the lesion may be mistaken for a small polypus or a urethral caruncle. A prolapse always has a broad base and may be increased in size by pulling it downward or reduced by seizing the urethral mucosa with a pair of delicate forceps above the tumor and pushing it upward in the direction of the bladder. A polypus or a caruncle, on the other hand, is usually pedunculated and cannot be reduced unless the tumor is pushed directly up into the urethral canal.

Prognosis.—The disease is rarely cured by means of local applications,

and in cases in which the prolapse is apparently restored it is almost certain to return after the treatment is stopped. The operative results, however, are generally satisfactory, and the urethra is permanently restored to its normal condition.

Cystitis, with subsequent infection of the kidneys, may result at times from a severe case of prolapse that is associated with purulent inflammation of the urethra.

Treatment.—The first indication is to discover and remove, if possible, the cause of the lesion. When the case is recent and the mucous membrane is hypertrophied, relaxed, or overstretched, permanent results may follow a non-operative plan of treatment; but when the changes are of a chronic nature and the tissues are atrophied or the urethra torn from its normal attachments, nothing short of an operation will accomplish any good.

The treatment may therefore be divided into:

General and local treatment.
Surgical measures.

General and Local Treatment.—These means may be tried in children of a strumous diathesis and in girls who are poorly nourished or chlorotic. In these cases there is no appreciable change in the character of the urethral mucosa beyond that of relaxation, which is a local manifestation of a general condition, and when the patient is given appropriate internal treatment and placed under good hygienic surroundings the prolapse gradually becomes reduced as the general health improves. Cases of prolapse dependent upon rectal or vesical tenesmus are likewise often restored when the cause of the local irritation is removed, and, finally, an eversion which is due to a swollen condition of the urethral mucous membrane in cases of acute urethritis entirely disappears when the inflammation subsides.

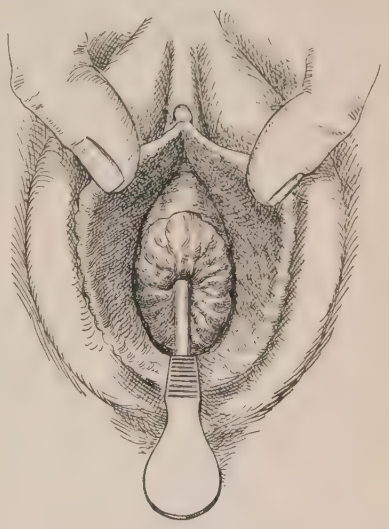


Fig. 557.—Diagnosis of Prolapse of the Urethral Mucous Membrane.

Demonstrating the presence of the opening of the urethra in the center of the prolapsed mass with a bladder sound.

Soon after beginning the appropriate medical treatment and removing the cause the prolapse itself demands our attention, as its permanent reduction can usually be hastened by means of non-operative methods. It is important that the patient should remain in bed three or four weeks, and that she should subsequently avoid any form of active exercise. The bowels are kept loose with a mild laxative and the urine is rendered bland and innocuous. A hot sitz-bath should be given daily for its effect upon the inflammation and as a stimulant to the relaxed mucous membrane.

When the swelling and edema have subsided, an effort should be made to reduce the prolapse, and after this is accomplished astringent injections or applications are made directly to the urethral canal by means of a reflux catheter or an applicator wound with cotton. A pint solution of alum (gr. x to f℥j) or tannic acid (gr. v–x to f℥j) should be injected with a reflux catheter into the urethra once a day; and twice a week the urethral mucosa is painted with a solution of nitrate of silver (gr. ij to f℥j).

Urethral suppositories containing alum (gr. ij–iv), tannic acid (gr. ij–iij), acetate of lead (gr. iv), or acetate of zinc (gr. ij–iv) are also beneficial, and may be substituted for the injections.

The above treatment should not be continued indefinitely, and we must resort to surgical methods if the local conditions are not cured or materially benefited after two or three months' trial.

Surgical Measures.—Surgical treatment is indicated when non-operative procedures fail to effect a cure in the class of cases referred to in the preceding paragraph, and it must be resorted to at once when the prolapse occurs in old and debilitated women, or when it is due to a difficult labor, overdilatation of the urethra, or traction exerted by a urethral tumor. In these cases the structural alterations are so marked and of such a permanent character that it is utterly useless to waste time in trying the effect of a non-operative plan of treatment, and hence an operation should be immediately advised.

The operation which gives the best results is Excision of the Prolapsed Mucous Membrane; performed as follows:

Technic of the Operation.—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 830 and 831.

Position of the Patient.—Dorsal position.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

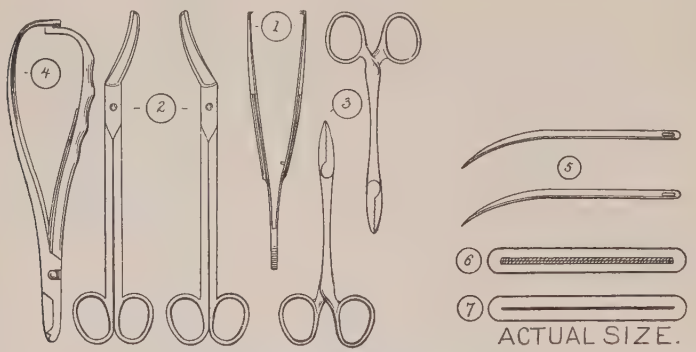


Fig. 558.—Instruments, Needles, and Suture Materials used in the Operation for Prolapse of the Mucous Membrane of the Urethra.

Instruments.—(1) Tissue forceps; (2) right and left Emmet's slightly curved scissors; (3) two short hemostatic forceps; (4) needle-holder; (5) two slightly curved round-pointed needles; (6) No. 7 braided silk; (7) plain cumol catgut No. 2, two envelopes.

Operation.—First Step.—The prolapsed mucous membrane is seized with tissue forceps and drawn taut. A silk ligature is then passed through the upper edge of the external meatus, directly across the canal, and made to emerge at the lower margin of the urethral opening.

Second Step.—The redundant mucous membrane is cut away in front of the ligature with scissors and the transfixion suture pulled partly out of the urethral canal with forceps.

Third Step.—The loop thus formed is cut, leaving two sutures, which are then tied to control the edges of the wound at opposite points and prevent retraction of the urethral mucosa.

Fourth Step.—A series of interrupted catgut sutures are then introduced about one-eighth of an inch apart completely around the circumference of the

external meatus, passing through the cut edge of the mucous membrane and the margin of the urethral opening. These sutures are then tied and the two silk fixation sutures removed.

Fifth Step.—The parts are douched with a solution of corrosive sublimate

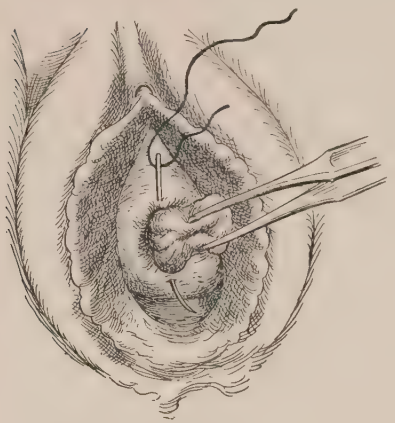


Fig. 559.—First Step.

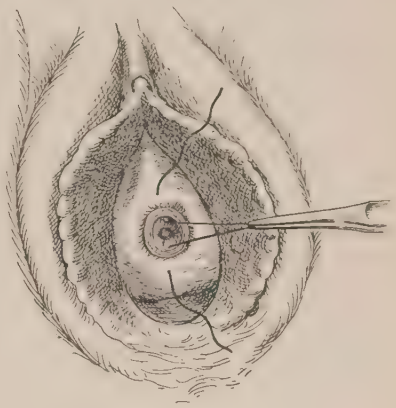


Fig. 560.—Second Step.

Operation for Prolapse of the Mucous Membrane of the Urethra.

(1 to 2000), followed by normal salt solution, and the vulva protected with a gauze compress held in position by a T-bandage.

Special Directions.—A continuous catgut suture should not be used to bring the edges of the wound together, as it tends to pucker the meatus and may lead to the formation of a stricture.

Fig. 561.—Third Step.

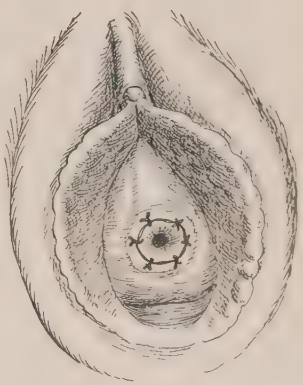


Fig. 562.—Fourth Step.

Operation for Prolapse of the Mucous Membrane of the Urethra.

Should there be a subsequent constriction of the urethral opening, a sound should be passed and the external meatus dilated.

After-treatment.—*Care of the Wound.*—The compress is temporarily removed when the bowels and bladder are evacuated and the parts douched daily with a solution of corrosive sublimate (1 to 2000), followed by hot normal salt solution.

The Bladder.—The urine must be voided either spontaneously or with a catheter every eight hours.

The Bowels.—The bowels are moved in twenty-four hours and then regularly once a day.

The Diet.—The patient is given a liquid diet (see p. 106) for the first twenty-four hours, and from that time on until she gets out of bed a convalescent diet (see p. 114) is indicated.

Getting Out of Bed.—The patient should remain in bed ten days.

DILATATION OF THE WHOLE URETHRA.

Causes.—The affection is not so common as dilatation of a portion of the urethra.

It may be caused by the spontaneous expulsion or the instrumental extraction of a vesical calculus or tumor, and it may also result from forcible dilatation of the urethra for diagnostic or therapeutic purposes. *Coitus per urethram* in women suffering with atresia of the vagina and the introduction of candles or other foreign bodies into the urethral canal for purposes of masturbation have been the causes of extreme cases of dilatation. A tumor or stricture situated near the external meatus may obstruct the flow of urine and the backward pressure may cause the urethra to gradually dilate above that point.

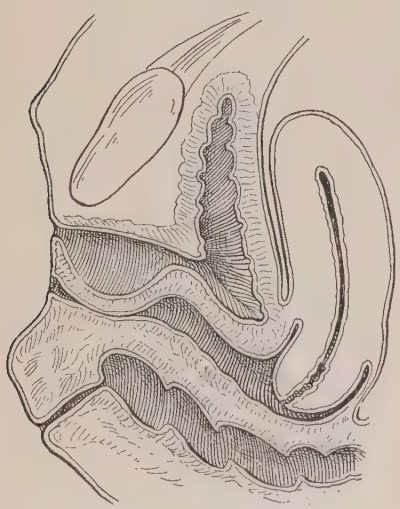


FIG. 563.—DILATATION OF THE WHOLE URETHRA.

"The hyperemia of the urethra which occurs in pregnancy, and which tends to produce overdistention of the veins, favors dilatation of the whole urethra. It is not uncommon to find an apparent increase of tissue in the walls of the urethra during uterogestation, and the dilatability of the canal is also often increased. This condition of the parts disappears during the involution which takes place after delivery; but when from any cause the process of involution is interrupted, the enlarged vessels and the relaxed condition of the urethral walls remain and sometimes increase. When to this state of the parts a catarrh of the mucous membrane is added, the enlargement of the membrane by swelling still further increases the caliber of the canal" (Skene).

Symptoms.—Incontinence is the most characteristic symptom of dilatation, and the urine may escape continuously or only when the patient makes a misstep or during the act of coughing, sneezing, or lifting a heavy object. The continual dribbling of urine causes the surrounding parts to become irritated, and unless the patient is very careful in keeping herself clean a severe vulvitis is likely to result. If the dilatation is accompanied by urethritis or prolapse, the urethral canal becomes sensitive and the patient complains of painful micturition.

In cases of moderate dilatation there is no incontinence of urine, but only a slight loss of control of the bladder and a frequent desire to urinate.

Physical Signs.—The canal never presents the appearance of an open tube, as its walls are always in apposition, and hence when the urethra is examined

either with the finger or an instrument we simply detect an extreme degree of dilatability.

The physical signs are elicited by (1) inspection, (2) touch, and (3) the use of the sound.

Inspection.—Inspection reveals an enlarged or pouting meatus and a distinct bulging in the vaginal wall corresponding to the course of the urethral canal.

Touch.—The enlarged urethra is felt through the vaginal wall as a more or less elastic and compressible elevation extending from the internal to the external meatus. The degree of dilatation is readily demonstrated by introducing the index-finger into the urethra and passing it into the bladder.

Sound.—The sound is a valuable aid in the diagnosis in cases of dilatation of the urethra. Not only are we able to judge of the degree of dilatation by noting the latitude of movement at the tip of the instrument, but we are also able to detect the thickness of the urethrovaginal septum by pressing the tissues with the sound against the index-finger in the vagina.

Prognosis.—The prognosis depends upon the cause. In the majority of cases dilatation of the urethra is due to traumatism, and the walls of the canal are torn and hopelessly overstretched. Hence nothing short of an operation will be of the slightest benefit, and when the dilatation is extreme even this method of treatment seldom effects a very satisfactory cure. If, however, the lesion is caused by subinvolution following labor or an obstruction at the external meatus, non-operative measures are indicated and usually effect a cure.

Treatment.—The first indication in the treatment is to restore the urethral mucosa to its normal condition and then to determine the degree of dilatation and the probable cause of the lesion. Dilatation is frequently accompanied by inflammation and prolapse of the urethral mucous membrane, and these lesions must first be relieved before directing our attention to the cure of the abnormal size of the canal. The treatment of these diseases is fully described elsewhere, and nothing further need therefore be said here.

When dilatation is due to subinvolution following labor or to a constriction at the external meatus, the structural changes in the wall of the urethra are seldom sufficiently well marked to preclude the possibility of effecting a cure by non-operative procedures; but when the lesion is caused by traumatism, the torn and overstretched tissues can never be restored to their normal condition by any form of local treatment, and hence we must resort to an operation to lessen the lumen of the canal.

The treatment may be divided into:

General and local treatment.

Surgical measures.

General and Local Treatment.—These methods of treatment should be tried, as stated above, when dilatation is due to subinvolution of the urethra or to an obstruction at the external meatus. In the former case the treatment may begin at once; but in the latter instance we must first dilate the stricture or remove the growth causing the obstruction.

The patient should avoid all forms of active exercise, such as walking, lifting heavy objects, and straining at stool. The bowels are kept regular with a mild laxative and the urine is rendered non-irritating. A hot sitz-bath should be given daily for its soothing effect upon the urethral mucous membrane and as a stimulating tonic to the tissues.

The local applications and injections that are made to the urethral canal are the same as those which are recommended in the treatment of prolapse of the urethra (see p. 603).

A pessary so constructed as to press against and lift up the urethra should be worn by the patient. Such an instrument often controls the incontinence by the mechanic pressure which it exerts, and at the same time it hastens the cure by supporting the relaxed urethral wall. Skene's pessary for prolapse of the bladder and the urethra is the instrument best adapted for use in these cases. It is introduced in the same way as a Hodge or a Smith-Hodge pessary, and is so constructed that the urethral canal is well supported and lessened in size. (See Cystocele, page 256.) The pessary will not remain in place and hold up the urethra if the pelvic floor or perineum is lacerated.

Surgical Measures.—The operation which gives the best results is excision of a portion of the anterior wall of the vagina and the posterior wall of the urethra. The amount of tissue removed depends upon the degree of dilatation. The wound is closed by transverse sutures of silkworm-gut which pass through the walls of the vagina and the urethra, but which do not include the urethral mucosa. The technic and the after-treatment of the operation are the same as those for the radical cure of a urethrovaginal fistula (see p. 768). After the stitches are removed the urethra should be supported by Skene's pessary.

Another method of operating, which has been successfully performed in cases of marked dilatation, is to dissect the urethra free up to the neck of the bladder and then to make a partial or complete rotation of the canal upon its axis and stitch it in this twisted condition to its original attachments.

URETHROCELE.

Synonym.—Sacculated urethra.

Definition.—Urethrocele is a dilatation or a sacculation of the middle third of the posterior wall of the urethra. The anterior wall remains in its normal position, and the shape of the urethra is changed from a slightly curved canal to that of a more or less well-defined triangular space.

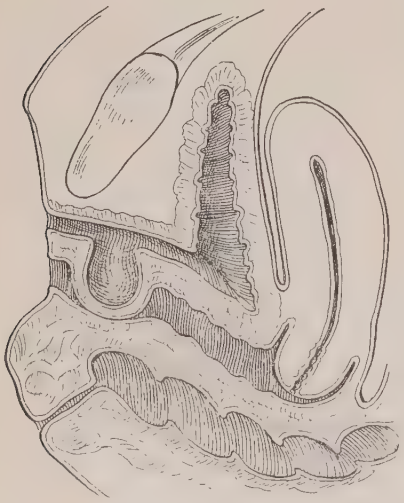


FIG. 564.—URETHROCELE.

Causes.—Urethrocele is more frequently observed than dilatation of the whole urethra, and the most common cause of the affection is traumatism occurring during a difficult labor. As the child's head advances it pushes before it the anterior wall of the vagina and the posterior wall of the urethra, and the tissues of the urethral canal are overstretched, torn, and bruised. The urethra sags at its middle portion and the dilatation is subsequently increased by the pressure of the urine during micturition, and eventually a distinct pouch or sacculation is developed. Another cause that is occasionally met is a stricture or a tumor at the lower portion of the urethra, which acts as an obstruction to the normal flow of urine and thus indirectly favors dilatation of the canal.

Symptoms.—The chief symptoms are frequent, painful, or difficult micturition and partial incontinence of urine. A frequent desire to urinate is

present in the vast majority of the cases. The pain during micturition is due to a coexisting urethritis which is a frequent complication of urethrocele and indirectly caused by the lesion. The urine that is arrested and retained in the pouch of the urethrocele undergoes decomposition, becomes alkaline, and by its irritation sets up a subacute urethritis. The straining efforts which some patients make while voiding urine are due to the obstruction caused by the sacculated condition of the urethra and to the vesical tenesmus which is occasionally excited by the lesion.

Partial incontinence of urine is a constant and characteristic symptom of dilatation of the middle third of the urethra. The urine does not escape continuously, but at irregular intervals, in jets or spurts during the act of coughing, sneezing, laughing, or lifting a heavy object, and when the patient makes a misstep. The incontinence is not due to a want of control

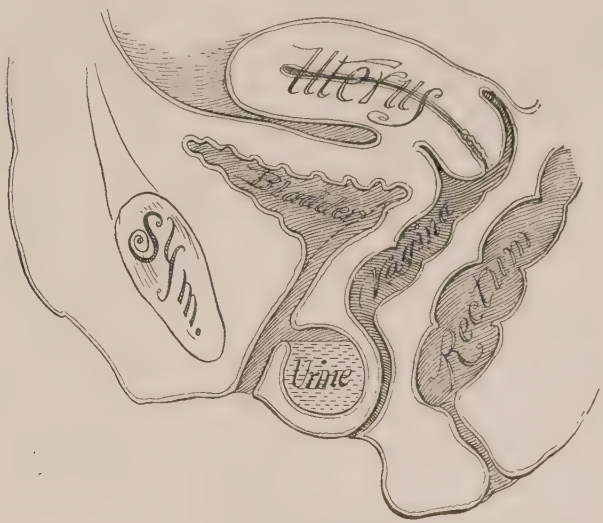


Fig. 565.—Urethrocele.
Showing the urine which is retained in the urethrocele at the time of urination.

of the bladder, but to the urine being ejected from the pouch of the urethrocele, where it was arrested and retained at the time of urination.

Physical Signs.—These are elicited by (1) inspection, (2) touch, and (3) the use of the sound.

Inspection.—Inspection reveals a distinct bulging in the anterior vaginal wall corresponding to the position of the middle third of the urethra.

Touch.—The urethrocele is felt through the vaginal wall as an elastic and compressible tumor occupying the position of the middle third of the urethral canal (Fig. 566).

Sound.—The use of the sound is a valuable means of determining the presence of a urethrocele. If the instrument is introduced into the urethra with its point directed downward against the posterior wall of the canal, it will slip into the sacculation and can be easily felt by the examining finger through the intervening tissues of the vagina. Again, if the tip of the sound is now pressed firmly against

the most dependent portion of the urethrocele, the exaggerated distention which results at that point in the vaginal wall is readily seen.

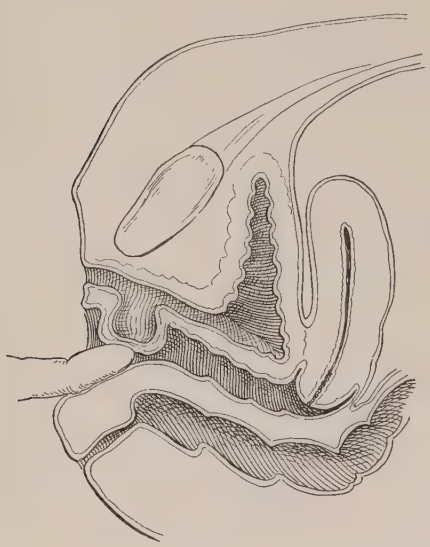


Fig. 566.—Touch.

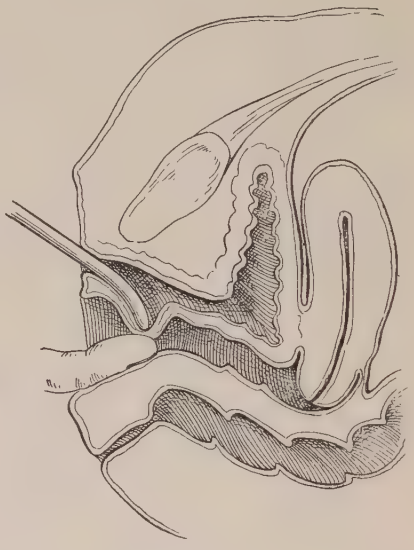


Fig. 567.—Sound.

Physical Signs of Urethrocele (page 609).

Fig. 566, feeling a urethrocele through the vagina with the tip of the index-finger; Fig. 567, demonstrating the presence of a urethrocele by means of a sound.

Differential Diagnosis.—Urethrocele must be distinguished from a suburethral abscess and a tumor of the vaginal wall.

Urethrocele.	Suburethral Abscess.
1. Indistinct bulging.	1. Prominent tumor.
2. Situated in the anterior vaginal wall.	2. Same.
3. Disappears on pressure.	3. Only partially disappears when some of the pus is squeezed out into urethra.
4. Tumor elastic and compressible.	4. Fluctuating and prominent.
5. No tenderness.	5. Very painful on pressure.
6. No pain on walking or coitus.	6. Very painful.
7. Only the vaginal and urethral walls between the examining finger and a sound in the urethra.	7. The thickness of the intervening structures is increased by the presence of the abscess.

Urethrocele.	Vaginal Tumor.
1. Situated in the anterior vaginal wall.	1. Same.
2. Indistinct bulging.	2. Prominent tumor.
3. Disappears on pressure.	3. Does not disappear.
4. Tumor elastic and compressible.	4. Tumor firm.
5. Only the vaginal and urethral walls between the examining finger and a sound in the urethra.	5. The thickness of the intervening structures is increased by the tumor.

Prognosis.—There is no tendency toward a spontaneous cure, and if nothing is done, the dilatation gradually increases. Treatment is followed by good results in the majority of the cases.

Treatment.—The treatment of urethrocele is divided into:

Non-operative procedures.

Surgical methods.

Non-operative Procedures.—This form of treatment is indicated in cases in which the affection is due to an obstruction at the external meatus, and should be instituted after removing the tumor or dilating the stricture as the case may be. As the affection is usually associated with urethritis, the next step in the treatment is to cure this condition by the local and general means already described in discussing that disease (see p. 594). After the urethritis has been relieved local applications and injections are made to the urethra to stimulate and contract the tissues. These applications are the same as those recommended in the treatment of prolapse of the urethra (see p. 603).

Skene's pessary (Fig. 256) should be worn from the beginning of the treatment to support the urethral canal and hasten the cure of the lesion. The use of the pessary materially assists in the cure of the urethritis, as it obliterates the sacculation and prevents the accumulation of urine which would otherwise be retained, become alkaline, and keep up the inflammation.

Surgical Methods.—Operative procedures are indicated at once when the urethrocele is caused by the traumatism of labor, as we cannot hope to restore the torn and overstretched structures to their normal condition by any form of local treatment. They should also be instituted when the non-operative plan of treatment has failed to effect a cure in the class of cases referred to above.

The management of these cases is carried out as follows:

1. Make an artificial urethrovaginal fistula.
2. Treat the urethritis.
3. Close the fistula.
4. Introduce Skene's pessary.

Make an Artificial Urethrovaginal Fistula.—If an obstinate urethritis is present, an opening should be made at the most dependent part of the urethrocele and the mucous membrane of the vagina and the urethra united by interrupted catgut sutures to insure the permanency of the artificial fistula.

The object of the operation is to drain the urine through the false opening and prevent its accumulation and subsequent decomposition. The cause of the urethritis is thus removed and its cure rendered possible.

Treat the Urethritis.—The urethritis is now treated by the local and general methods described on page 594, and after the mucous membrane of the urethral canal has been restored to its normal condition the artificial fistula is closed.

Close the Fistula.—The redundant tissues which form the urethrocele are cut away to reduce the size of the canal at the point of sacculation and the fistulous opening closed as described in the operation for urethrovaginal fistula on page 768.

Introduce Skene's Pessary.—After the stitches have been removed and the patient gets out of bed, Skene's pessary should be introduced and worn for several months to act as a support to the urethral canal and to guard against a return of the dilatation.

Variation in Technic.—In cases of urethrocele which are not complicated by urethritis the sacculation should be removed at once by operative measures. This is accomplished by making an opening through the vaginal wall into the urethra and cutting away the redundant tissues which form the urethrocele. The wound is then sutured and closed as described in the operation for urethrovaginal fistula on page 768. When the patient is ready to get out of bed, Skene's pessary is introduced and worn continuously for several months.

SUBURETHRAL ABSCESS.

Description.—The abscess occupies the urethrovaginal septum; it varies in size from a cherry to a small lemon; and communicates with the urethra by means of a small opening.

Causes.—This affection is not common. It is supposed to be due in the majority of cases to inflammation and occlusion of Skene's ducts, which are subsequently followed by an ulcerative perforation of the wall of the urethra. It has also been observed associated with a urethrocele caused by the traumatism of labor. In these cases the wall of the urethra is torn, and the inflammation, with the subsequent formation of pus in the tissues beneath the urethral canal, is supposed to be due to the presence of the retained and decomposed urine.

Symptoms.—As in abscesses of other parts of the body, pain is the most prominent and characteristic symptom, and its severity depends upon the extent

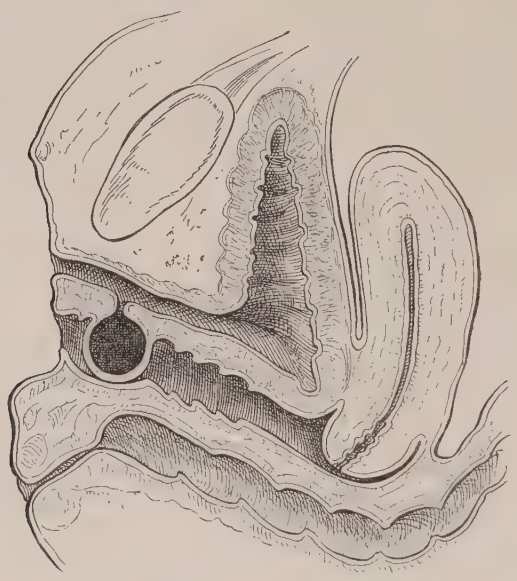


Fig. 568.—Suburethral Abscess.

of the purulent inflammation. The patient complains of severe suffering during defecation and urination; sexual intercourse is impossible; and in many instances walking is prevented by the exquisite local tenderness.

Physical Signs.—The patient is anesthetized and placed in the dorsal position. The physical signs are elicited by (1) inspection, (2) touch, and (3) the urethroscope.

Inspection.—On separating the labia a well-defined ovoid tumor is observed on the anterior vaginal wall, corresponding in a general way to the situation of the urethral canal.

Touch.—The tumor is fluctuating in character and decreases in size upon pressure, the pus being forced out of the sac into the urethral canal and escaping through the meatus.

Urethroscope.—An opening is seen in the posterior wall of the urethra through which a fine probe may be passed into the sac and felt by the examining

finger against the anterior vaginal wall. When pressure is made upon the abscess through the vagina, the pus can be seen escaping from the opening into the urethra.

Treatment.—Two methods of operating present themselves—complete removal of the sac or opening the abscess and packing the cavity with gauze.

If the abscess is small, the entire sac may be carefully dissected out through a vaginal incision and the wound immediately closed by interrupted sutures.

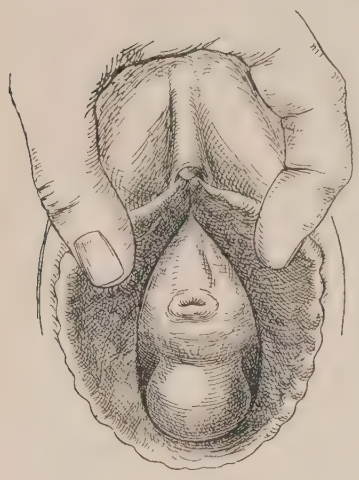


Fig. 569.—Inspection.

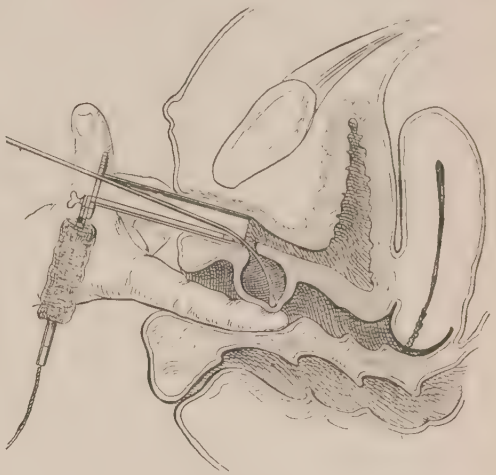


Fig. 570.—Urethroscope.

Physical Signs of a Suburethral Abscess.

Fig. 569 shows the abscess being exposed by separating the labia; Fig. 570 shows the opening of the abscess in the urethral floor seen through a urethroscope and the introduction of a probe into the sac.

The technic of this operation is fully described under the complete removal of vaginal cysts (see p. 281).

A large abscess should never be treated by removing the entire sac on account of the danger of hemorrhage and wounding important neighboring structures. The sac wall should only be partially extirpated and the wound allowed to heal by granulation. The technic of this operation is fully discussed under the partial removal of vaginal cysts (see p. 280).

CARUNCLE.

Synonyms.—Vascular or painful tumor of the urethra; irritable vascular excrescence of the urethra.

Pathologic Anatomy.—The growth is covered with mucous membrane and is composed of connective tissue, dilated capillaries, and nerve filaments.

Description.—These tumors usually occur late in the child-bearing period of a woman's life, but they have also been observed in very young women and in those who have passed the menopause.

Urethral caruncles, as a rule, are situated at the margin of the external meatus, usually on its posterior portion, and in some cases they are also found in other parts of the urethral canal. They are the most frequent tumors of the urethra, and while they generally occur singly, multiple caruncles are not uncommonly met. They are usually pedunculated, but may be sessile; they vary in size from a hempseed to that of a small grape; they are exceedingly painful upon touch and

bleed readily when irritated; they may be pale or bright red in color, resembling more or less a raspberry in appearance; and in some cases they are erectile and become swollen at the time of menstruation. Urethral caruncles are occasionally met that are not sensitive and have but little tendency to bleed. These cases are the exception, however, as the vast majority of caruncles are exquisitely sensitive and very friable. The painful condition is probably due to the increased nerve-supply and also to the fact that the epithelium often becomes macerated and destroyed, exposing the sensitive nerve-endings in the growth.

Symptoms.—The most characteristic symptom is pain during urination. The greatest suffering occurs while the urine is being passed, and after the act the pain lessens in severity until in the course of ten or fifteen minutes only a slight smarting remains. The character of the pain varies in individual cases: sometimes it is so agonizing in character that the patient is physically prostrated after each act of urination; and in others it may be so slight as to cause but little inconvenience. In some cases pain is also caused by walking or by friction of the clothing, and occasionally sexual intercourse is rendered impossible on account of the severe suffering and the vaginismus which are frequently associated with these neoplasms.

The bleeding from a urethral caruncle never amounts to more than a slight oozing.

The effect upon the general health in aggravated cases is marked; the patient becomes physically weakened and emaciated from the long-continued suffering, the loss of sleep and exercise, and the lack of desire for food; and eventually she presents all the appearances of a woman dying from an incurable organic disease.

A non-sensitive caruncle may cause no symptoms whatever.

Diagnosis.—The diagnosis is based upon the subjective symptoms and the physical appearance of the tumor.

A small, red, raspberry-like growth attached to the margin of the external meatus, which is sensitive upon touch and associated with painful urination, is, in nearly every instance, a urethral caruncle.

Prognosis.—A urethral caruncle is likely to recur unless it is completely extirpated. A non-sensitive tumor is usually discovered by accident during an examination for other conditions, and unless it causes symptoms it should not be removed, as a painful caruncle may spring up in its place.

Treatment.—The treatment is operative; local applications have no curative effect whatever.

A general anesthetic should be employed, as a rule, as the growth cannot usually be satisfactorily removed under the local influence of cocain.

A pedunculated caruncle should be seized by tissue forceps and its pedicle severed close to the urethral mucous membrane with scissors. If the pedicle is thick, the raw surfaces should be brought together with one or two interrupted catgut sutures.

A sessile tumor should be seized with tissue forceps, lifted out of its bed, and excised well below its base with curved scissors; the wound is then closed with interrupted catgut sutures.

When the caruncle is situated high up in the urethra, the canal should be dilated and the tumor exposed with a speculum. It is then removed in the same way as a pedunculated or sessile growth situated at the margin of the external meatus.

CARCINOMA.

Cancer of the urethra is a very rare condition, and in the majority of cases that have been observed it occurred at or near the menopause or even later. The

affection may be either *primary* or *secondary;* but in most instances the vulva or the vagina is primarily involved. Cancer of the bladder seldom extends to the urethra.

Symptoms.—The symptoms of *secondary cancer* of the urethra, in addition to those caused by the primary affection, are due to the obstruction of the canal by the new-growth. There is always more or less difficulty in passing urine from the beginning, but later on, when the canal becomes completely closed, symptoms of retention manifest themselves.

Primary cancer of the urethra is usually associated with an irritating acrid discharge which produces pruritus vulvæ and intense itching about the meatus. The urethra soon becomes inflamed and the patient complains of painful urination.

Diagnosis.—*Secondary cancer* is easily recognized as an extension of the disease from the vulva or the vagina, and when the affection is *primary*, the character of the tumor is revealed by palpation through the vaginal wall and by the use of the urethroscope.

Treatment.—Nothing can be done in cases of *secondary* cancer of the urethra beyond keeping the urethral canal patulous. If this cannot be accomplished, the bladder should be drained either through an artificial vesicovaginal fistula or a suprapubic opening.

Removal of the urethra is indicated in cases of *primary cancer* in which the disease is limited to the canal. The removal of the distal end of the urethra does not interfere with the patient's control of the urine. If it is necessary to remove the whole canal, the bladder should be sutured and drained by a suprapubic opening. Advanced cases are treated in the same way as secondary involvements of the urethra.

SARCOMA.

The Symptoms, Diagnosis, and Treatment of sarcoma of the urethra are the same as those of carcinoma.

CYSTS.

Causes.—Small retention cysts of the urethral glands are occasionally observed. They may occur at any age and are not limited to any particular portion of the urethra.

Symptoms.—These cysts do not cause urethritis, and hence they result in no inconvenience unless their presence constricts the lumen of the canal and interferes with the flow of urine.

Diagnosis.—Their presence is revealed by palpation through the vaginal wall and by the use of the urethroscope.

Treatment.—The cysts are exposed with a speculum and the superficial portion of their sacs snipped off with scissors; the base of each cyst is then touched with pure carbolic acid.

POLYPI.

Description.—Mucous or fibroid polypi are rarely observed in the urethra. They may be single or multiple, and are sometimes found hanging from the meatus by a slender stalk. They may occur at any age, and cases have been observed in very young children.

Symptoms.—They cause no inconvenience whatever unless they become inflamed or obstruct the lumen of the urethral canal.

Diagnosis.—A urethral polypus is easily recognized by inspection when it

protrudes from the meatus, and when it is situated high up in the canal it may be seen through a urethroscope.

Treatment.—The growth may be easily removed by twisting its pedicle or by snipping it off with scissors; when it is situated high up in the canal, it must first be exposed to view with a speculum.

CONDYLOMATA.

Causes.—Papillomatous or warty excrescences in the urethra are generally associated with similar vegetations of the vulva. They are usually caused by gonorrheal discharges or the oozing from mucous patches on the external genitals; they have also been observed during pregnancy and as the result of an irritating non-specific leukorrhea.

Symptoms.—Large condylomata may obstruct the urethral canal and interfere with the flow of urine. The disease is usually accompanied by an acrid, fetid discharge, which often causes a severe urethritis and painful excoriations of the vulva.

Diagnosis.—The diagnosis is based upon the presence of papillomatous growths on the vulva and the exposure of the excrescences in the urethra with a urethroscope.

Treatment.—The papilloma is seized with tissue forceps, lifted out of its bed, and excised with curved scissors close to the healthy tissue. The raw surface is then cauterized with Paquelin's cautery or touched with pure carbolic acid. When the growths are situated high up in the urethral canal, they must first be exposed with a speculum.

CHAPTER XXX.

THE BLADDER.

METHODS OF EXAMINATION.

The bladder can be examined by the following methods:

Direct inspection.
Palpation.
Percussion.
Sounding.
Hydrostatic dilatation.
Cystoscopy or Indirect inspection.
Chemic, Microscopic, and Bacteriologic examinations of the urine.

DIRECT INSPECTION.

Limitations.—While no portion of the bladder can be examined by direct inspection, a protrusion of the organ into the vagina or a distention above the symphysis pubis can readily be seen.

Information.—The following conditions can be recognized:

Lower Abdomen.—A rounded tumor or prominence above the symphysis can be seen when the bladder is distended with urine.

Anterior Vaginal Wall.—A bulging of the anterior wall of the vagina is observed when the bladder is filled with urine. A cystocele also forms a distinct

tumor in the same situation, which is, however, accompanied by more or less prolapse of the bladder wall and the vagina. A vesicovaginal fistula can be readily recognized when the anterior wall of the vagina is exposed to view.

Preparation of the Patient.—The urine should be voided naturally just before the examination and the corset removed as well as all clothing that constricts the waist or interferes with inspection of the lower abdomen.

Position of the Patient.—**Abdominal Inspection.**—The patient should be placed in the horizontal recumbent position with the lower extremities extended and on the same plane as the rest of the body. This position thoroughly exposes the hypogastric region and increases the size of the swelling caused by the distended bladder.

Vaginal Inspection.—The dorsal position should always be employed.

Technic.—**Abdominal Inspection.**—The examiner stands at the side of the patient and carefully inspects the hypogastric region, noting any change in its size or shape.

Vaginal Inspection.—The examiner now sits or stands in front of the vulva and introduces the index-finger of the left hand into the vagina with the palm directed downward. The perineum and the posterior vaginal wall are now retracted with the finger until the anterior surface of the vagina comes into view (Fig. 202).

PALPATION.

Limitations.—The entire bladder can be thoroughly palpated by means of (1) vaginal, (2) abdominal, and (3) vagino-abdominal touch.

Information.—The following conditions can be recognized by palpation:

Vaginal Touch.—The base of the bladder can be examined and pathologic changes recognized. We may thus determine the presence of a distended bladder, cystocele, foreign bodies, calculi, neoplasms, and inflammation.

Abdominal Touch.—If the bladder is distended, a round, tense, elastic tumor can be felt above the symphysis.

FIG. 571.—EXAMINATION OF THE BLADDER BY VAGINO-ABDOMINAL TOUCH.

Shows the method of recognizing pathologic conditions of the bladder by palpation.

Vagino-abdominal Touch.—Bimanual palpation gives the most satisfactory results, as the bladder can be thoroughly explored with the index-finger in the vagina and the fingers of the other hand making counter-pressure downward through the abdominal walls above the symphysis. The organ can thus be rolled in all directions between the opposing fingers, and the thickness, mobility, and sensitiveness of its walls, as well as other pathologic conditions, clearly determined. We can thus recognize the presence of a distended bladder, neoplasms, calculi, foreign bodies, tubercular involvement, and localized areas of inflammation.

Preparation of the Patient.—Same as for Inspection.

Position of the Patient.—The dorsal posture is usually employed in palpating the bladder; the knee-chest position, however, can also be used when the organ is examined bimanually.

Anesthesia.—In order to make a satisfactory examination an anesthetic should be employed in women who have fat belly walls or rigid abdominal muscles.

Technic.—The examiner sits or stands in front of the vulva and palpates the abdominal wall above the symphysis (*abdominal touch*), noting any change in its size, shape, or resistance; he then introduces the index-finger of the left hand into the vagina (*vaginal touch*) and notes the absence or presence of bulging in the anterior vaginal wall and any abnormal condition at the base of the bladder; and, finally, the fingers of the free hand are again placed over the symphysis and pressure is made downward through the abdominal wall until the tip of the vaginal finger is felt (*vagino-abdominal touch*), when the whole organ is carefully examined by rolling it in all directions between the two points of resistance.

PERCUSSION.

This method of examination is employed to recognize a distended bladder.

Normally the percussion-note over the hypogastric region is tympanitic, and so long as this is not altered the bladder cannot be distended with urine. When, however, a round, more or less tense, and fluctuating tumor is present between the symphysis and umbilicus and percussion gives a flat note over the entire swelling, we may be almost certain that the bladder is full of urine. We should, however, under these circumstances verify the diagnosis by catheterizing the bladder.

SOUNDING.

Limitations.—The entire cavity of the bladder can be explored with the sound.

Information.—By sounding the bladder we can determine the presence of a foreign body or a calculus, and if combined with vaginal inspection or touch we can estimate also the thickness, the mobility, and the sensitiveness of the walls of the organ as well as diagnose a cystocele.

Preparation of the Patient.—The urine must be voided naturally just before the patient is examined.

When the patient is placed on the table, the meatus and the vulva must be

Fig. 572.—Steel Bladder Sound.
Instrument used for sounding the bladder.

thoroughly sterilized to prevent infection being carried into the bladder. This is accomplished by scrubbing the parts with a gauze sponge saturated with tincture of green soap and warm water, and then washing them with a solution of corrosive sublimate (1 to 2000), which in turn is removed by douching with sterile water or normal salt solution.

Position of the Patient.—Dorsal posture.

Instruments.—A short steel female bladder sound with a slightly curved end is the only instrument required.

Antisepsis.—The sound is boiled in a soda solution for five minutes and then placed in a tray until ready for use. Rubber gloves should be worn to guard against contaminating the instrument and carrying infection into the bladder. Liquid white vaselin which has been previously sterilized is used to lubricate the sound and facilitate its introduction into the bladder.

Anesthesia.—No anesthetic is required.

Technic.—The examiner sits in front of the vulva and exposes the external urinary meatus. The sound is then introduced into the urethra and passed directly into the bladder. The instrument is then moved about in various directions, taking care not to injure the mucosa by rough manipulations, and the presence of any pathologic conditions noted. In cases of cystocele by rotating the tip of the sound downward into the sacculation the point of the instrument can be seen and felt through the anterior vaginal wall. Again, if the tip of the sound is directed downward and at the same time the index finger is introduced into the vagina, we are able to estimate the mobility, the thickness, and the sensitiveness of the base of the bladder.

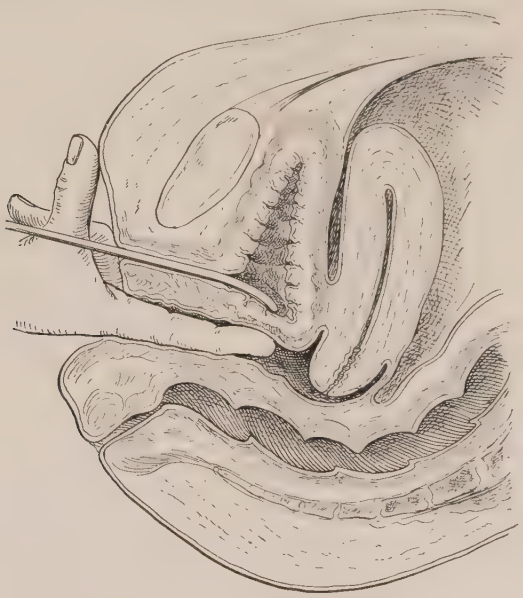


FIG. 573.—SOUNDING THE BLADDER.
Shows the method of estimating the thickness of the bladder with a sound and the index-finger.

HYDROSTATIC DILATATION.

Information.—Hydrostatic dilatation of the cavity of the bladder is the most important method of examination we have at our command to estimate the capacity of the organ and diagnose cases of contraction which are often the cause of frequent micturition. It is also useful in demonstrating the presence of a cystocele by increasing the intravesical pressure, which forms under the circumstances a round, tense, elastic tumor in the anterior vaginal wall. When the reservoir is lowered and the intravesical pressure is relieved, the tumor disappears and the vaginal wall becomes wrinkled and relaxed.

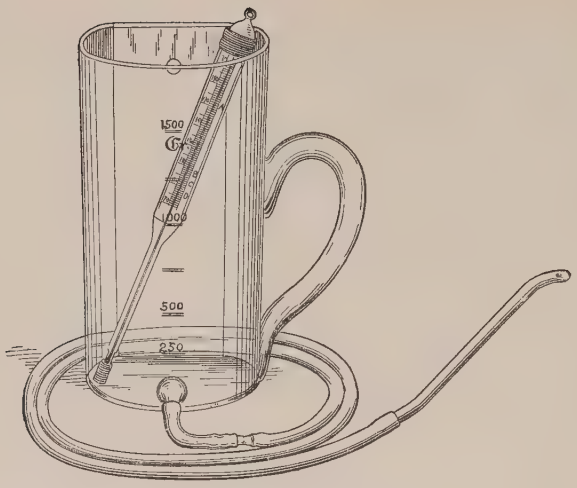


FIG. 574.—ASHTON'S APPARATUS FOR HYDROSTATIC DILATATION OF THE BLADDER.

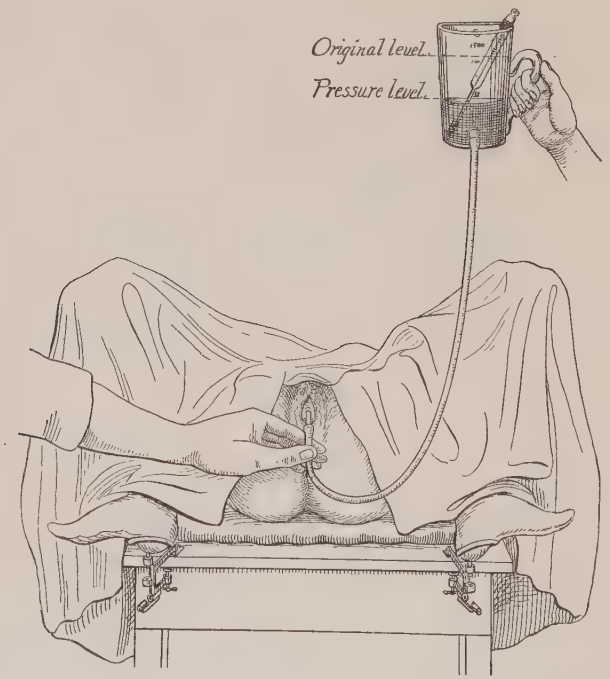


FIG. 575.—HYDROSTATIC DILATATION OF THE BLADDER.

Shows the method of employing hydrostatic dilatation. The difference between the original level and the pressure level of the fluid in the reservoir is the capacity of the bladder.

Preparation of the Patient.—Same as for Sounding.

Position of the Patient.—Dorsal posture.

Apparatus.—The apparatus consists of a glass catheter, four feet of rubber tubing, a graduated glass reservoir, and a thermometer.

Antisepsis.—The apparatus is sterilized by boiling it in plain water for five minutes.

Anesthesia.—No anesthetic is required.

Technic.—After placing the patient in the proper position with the hips resting on a surgical pad, the glass reservoir is filled with warm normal salt solution (100° F.) and a small quantity of the fluid allowed to escape through the catheter to prevent air getting into the bladder. The examiner now exposes the meatus and passes the catheter directly into the bladder. The reservoir is then held about four feet above the surface of the table and the fluid allowed to flow into the bladder until the patient complains of distention. The level of the fluid in the reservoir is now compared with the original level and the difference in the quantity between the two will indicate the holding capacity of the bladder.

To demonstrate the presence of a cystocele the same apparatus is employed, and after the catheter is introduced into the bladder the anterior vaginal wall becomes alternately distended and relaxed as the reservoir is raised and lowered.

CYSTOSCOPY OR INDIRECT INSPECTION.

Limitations.—The whole surface of the mucous lining of the bladder can be exposed to view by a cystoscopic examination.

Information.—By means of a cystoscope all of the pathologic conditions met in the bladder can be thoroughly examined by indirect inspection and an accurate diagnosis made in nearly every instance. The value of a cystoscopic examination in cases of cystitis cannot be overestimated, because the character of the treatment frequently depends upon the situation and nature of the inflammatory lesions.

Preparation of the Patient.—The colon must be thoroughly evacuated by giving the patient a bottle of citrate of magnesia, followed by a large rectal enema of soapsuds and warm water. No food should be taken for several hours before the examination and the urine must be voided naturally immediately before the patient is examined.

When the patient is placed on the examining table, the external urinary meatus and the vulva must be thoroughly sterilized. (See *Sounding the Bladder.*)

Position of the Patient.—Two positions are employed in making a cystoscopic examination: The dorsosacral elevated and the knee-chest postures.

Dorsosacral Elevated Position.—The hips must be elevated from twelve to fourteen inches above the surface of the table so as to raise the pelvis and allow the bladder to balloon out when the cystoscope is introduced.

This is the best position for making a cystoscopic examination and should be employed in all cases except in women who are very fat.

Knee-chest Position.—The patient is placed in the knee chest position with the knees separated about twelve inches and the buttocks on a line with the middle of the calves of the legs. If the patient is examined under a general anesthetic, she can be held securely in this position by supporting the hips and thighs with Lentz's modified Edebohls's leg-holders.

Very fat women should always be placed in the knee-chest posture for a cystoscopic examination, as the bladder does not balloon well in the dorso-sacral elevated position and consequently a thorough inspection of its cavity cannot be made.

Instruments.—(1) The Ashton-Gans cystoscopes (three sizes, Nos.24, 30, and 36, French scale); (2) Kelly's cone-shaped urethral dilator; (3) long, deli-

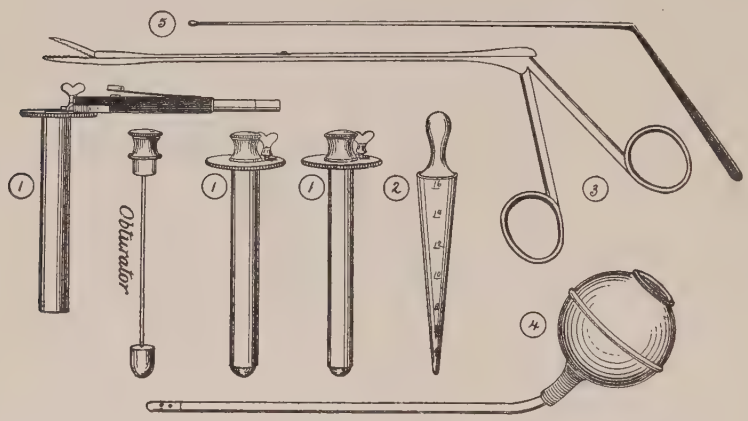


Fig. 576.—Instruments for Cystoscopy or Indirect Inspection of the Bladder.

cate, alligator-jaw forceps; (4) Ashton's modified Snell's residual urine evacuator; (5) Kelly's ureteral searcher.

The **cystoscopes** and the **urethral dilator** are described under Urethroscopy on page 585.

The Residual Urine Evacuator.—This apparatus is used to remove the residual urine and keep the bladder dry during the examination. It consists of a

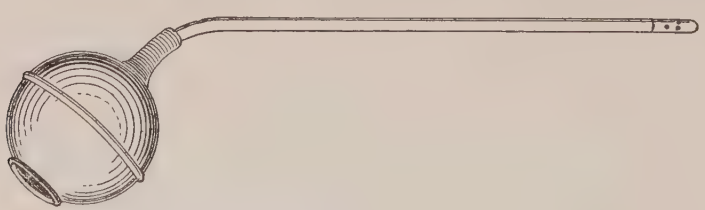


Fig. 577.—Ashton's Modification of Snell's Residual Urine Evacuator.

rubber exhaust bulb and a long delicate metal tube which is perforated at its distal end by several small openings.

The Alligator-jaw Forceps.—This instrument is used to hold small balls of absorbent cotton which are employed to absorb the residual urine, keep the vesical end of the cystoscope clean, and remove secretions from the mucous membrane of the bladder when they obscure the parts.

The Ureteral Searcher.—This instrument is a long delicate sound which is used to probe the vesical mucous membrane and locate the ureteral orifices.

Sterilization of the Instruments.—The cystoscopes, the urethral dilator, the urine evacuator, the alligator-jaw forceps, and the searcher are boiled for five minutes in a soda solution, and the light-carrier, which includes the lamp and slender connecting tube, is immersed for ten minutes in a 3 per cent. solution of carbolic acid. The handle of the light-carrier is wrapped in sterile gauze (p. 587).

Absorbent Cotton and Boric Acid Solution.—Small balls of absorbent cotton and a saturated solution of boric acid must be on hand to absorb the residual urine, keep the cystoscope clean, remove the secretions from the mucous membrane, and sterilize the vesical trigone if it is necessary to use the ureteral searcher.

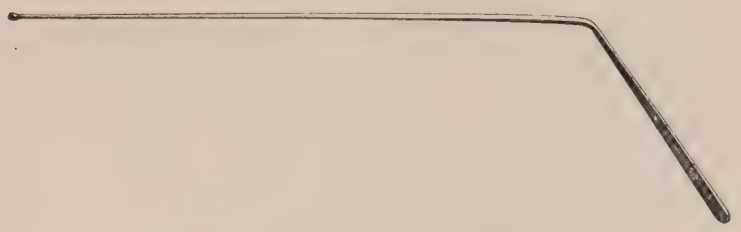


FIG. 578.—KELLY'S URETERAL SEARCHER.

Liquid White Vaselin.—This material is used to lubricate the instruments and is sterilized in the same manner as liquid soap (see p. 814).

FIG. 579.—CYSTOSCOPY OR INDIRECT INSPECTION OF THE BLADDER WITH THE PATIENT IN THE DORSAL ELEVATED POSITION (page 624).

Rubber Gloves.—The examiner should wear rubber gloves to guard against contaminating the instruments and carrying infection into the bladder.

Anesthesia.—A general anesthetic is required, as a rule, for the first examination, and if a local lesion is discovered it may be treated subsequently under the influence of a 10 per cent. solution of cocain applied to the urethra on a pledget of cotton.

Technic.—The examination should be made in a darkened room, and is divided into three steps as follows:

Dilatation of the external urinary meatus.
Introduction of the cystoscope.
Inspection of the bladder.

Dilatation of the External Meatus.—The dilator is introduced into the urethra with a rotary movement until the meatus is stretched to about 12 millimeters. A greater dilatation than 16 to 18 millimeters should never be practised on account of the danger of rupturing the urethral fibers and causing a permanent incontinence of urine (see Fig. 534).

Introduction of the Cystoscope.—The obturator is placed in the cystoscope and the instrument passed directly into the bladder by following the natural

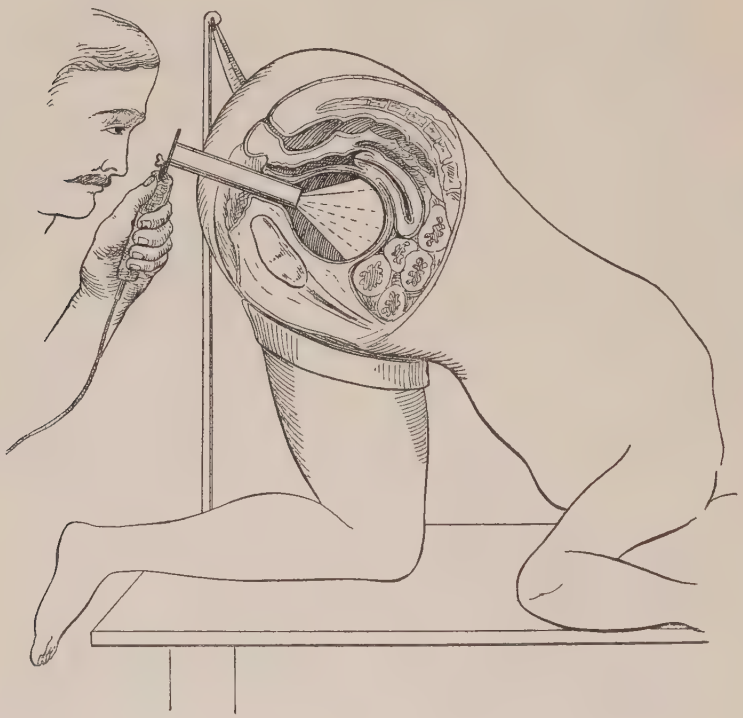


Fig. 580.—Cystoscopy or Indirect Inspection of the Bladder with the Patient in the Knee-chest Position.

direction of the urethral canal (see Fig. 535). The obturator is then withdrawn, the light-carrier attached to the cystoscope, and the handle connected with the battery.

Inspection of the Bladder.—The current is turned on by pressing the button in the handle and the examiner looks through the cystoscope into the bladder (Fig. 579). If the bladder does not balloon out well, the fault is generally due to the patient being placed in an incorrect posture, and the difficulty is readily overcome by increasing the elevation of the hips, if the *dorsosacral elevated position* is used. Sometimes the air fails to enter the vagina when the *knee-chest posture* is employed, and if the bladder does not expand thoroughly a small speculum should be introduced beyond the vulvovaginal orifice.

The residual urine is now removed with the evacuator and the cavity of the bladder explored in all directions.

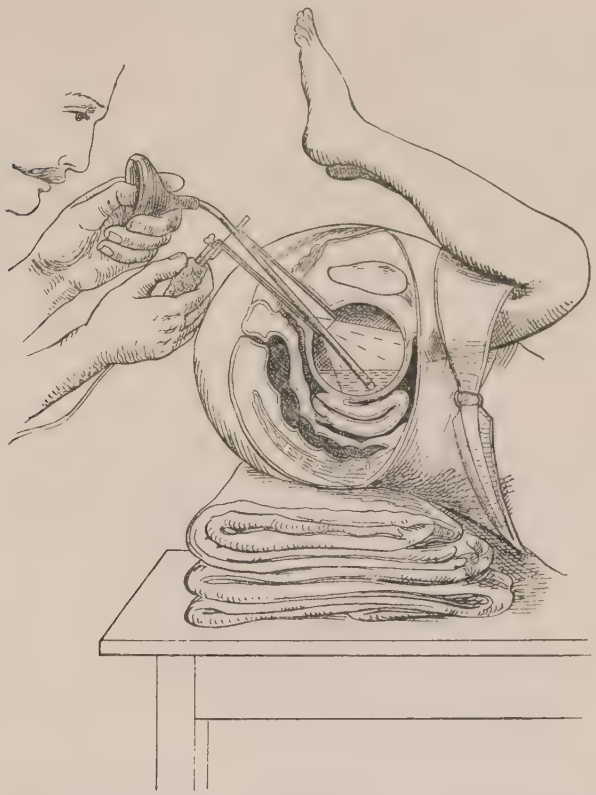


FIG. 581.—METHOD OF REMOVING THE RESIDUAL URINE DURING A CYSTOSCOPIC EXAMINATION.

CHEMIC, MICROSCOPIC, AND BACTERIOLOGIC EXAMINATIONS OF THE URINE.

Limitations.—These methods of investigation are limited to the examination of the urine.

Information.—We can determine the presence of a cystitis and the character of an infection.

Technic.—The urine should be obtained by catheterization, otherwise it becomes mixed with the secretions from the vagina and vulva. This method of obtaining the urine is especially necessary if a specimen is required when the patient is menstruating.

After introducing the catheter a small quantity of urine is first allowed to escape into a urinal; it is then collected directly into a bottle, which is corked with a cork stopper and a thick layer of cotton batting spread over the neck and securely tied. The bottle and the cork must have been previously sterilized by boiling them in plain water for five minutes, and the cotton batting must also have been rendered sterile.

The bottle of urine is carefully packed and sent to a laboratory for examination.

MALFORMATIONS OF THE BLADDER.

Anomalies of the bladder are practically the same in both sexes, and they are usually associated with marked malformations in other genito-urinary organs.

The following malformations have been noted:

Absence of the bladder.
Divided bladder.
Exstrophy of the bladder.

Absence of the Bladder.—This is an exceedingly rare anomaly, and in cases that have been recorded the ureters were either implanted in the urethra or in the rectum. The child is seldom born alive or perishes shortly after birth.

Divided Bladder.—In rare instances the bladder has been divided laterally into two parts by a membranous septum running antero-posteriorly. In these cases each half of the bladder has one ureteral orifice, the urethra opens

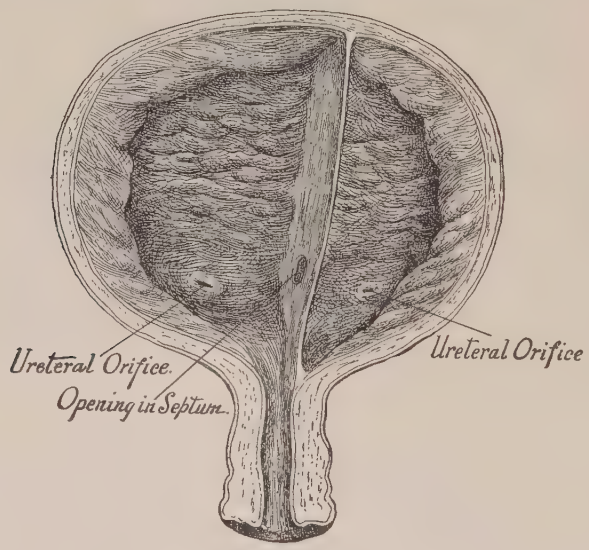


FIG. 582.—BLADDER DIVIDED INTO TWO PARTS BY A MEMBRANOUS SEPTUM.

into one of the compartments, and the urine from the other escapes through a small opening in the septum.

Exstrophy of the Bladder.—Extroversion of the bladder is five times more frequently met in males than in females. In this condition the abdominal walls and the symphysis pubis are separated and the anterior wall of the bladder is absent. The mucous membrane of the posterior vesical wall occupies the space formed by the separated structures, and the ureteral orifices, which are enlarged, can be readily seen. The bladder mucosa is generally more or less inflamed from exposure and covered with phosphatic deposits and spots of ulceration.

The genital organs may or may not be involved. Usually, however, the clitoris is split in two lateral halves; the vagina may be more or less rudimentary in character; but the uterus, the tubes, and the ovaries are, as a rule, normally developed.

The treatment is the same in both sexes and is described in treatises on general surgery.

DISEASES OF THE BLADDER.

CYSTITIS.

Definition.—Cystitis is an inflammation of the bladder due to the invasion of pathogenic organisms which lodge and develop either upon or within the walls of the organ.

Causes.—The causes of the affection are divided into:

The predisposing causes.
The exciting causes.

The Predisposing Causes.—The presence of pathogenic organisms in the urine, with but few exceptions, is not in itself sufficient to cause a cystitis in a healthy bladder, and it is therefore necessary, before an inflammation can be set up, that the organ should undergo certain pathologic changes in order to destroy or lessen its resisting power and render it a proper soil for microbes to lodge and develop in.

The predisposing causes may be summarized as follows:

1. Congestion.—This is one of the most common causes, and is due to a number of conditions, such as diseases of the uterus, the ovaries, and the tubes; pelvic and abdominal tumors obstructing the circulation; peritonitis; the normal congestion of menstruation, pregnancy, and the puerperal state; and exposure to cold.

2. Retention of Urine.—The retention may be *complete* or *incomplete;* in the former instance the damage to the bladder wall is due to acute overdistention, while in the latter case the residual urine undergoes ammoniacal decomposition and irritates the vesical mucous membrane. The following are the chief causes of retention: Strictures and neoplasms of the urethra; extravesical growths; cystocele; and displacements of the uterus.

3. Abnormal Urine.—The character of the urine may be abnormal and cause irritation of the vesical mucous membrane. This may occur from the elimination of turpentine, cantharides, or the oil of sabine when taken into the system and the ingestion of certain foods or alcoholic drinks. The changes which take place in the urine in cases of rheumatism and in those suffering with uric acid diathesis are also a predisposing cause of cystitis.

4. Foreign Bodies.—Vesical calculi, pencils, hairpins, and other foreign objects irritate or wound the bladder mucosa and thus predispose the tissues to the influence of pathogenic organisms.

5. Traumatism.—The bladder may be injured during the introduction of a catheter, a sound, or a cystoscope, or by an instrument at the time of an operation upon the organ, and it may also be contused or bruised by the pressure of the child's head during labor or by a kick or blow on the lower abdomen.

6. Neoplasms.—Tumors of the bladder are associated, as a rule, with cystitis.

The Exciting Causes.—The pathogenic organisms which are most frequently found to be the exciting causes of cystitis are:

Colon bacillus.	Proteus vulgaris.
Gonococcus.	Tubercle bacillus.
Streptococcus pyogenes.	Typhoid bacillus.
Staphylococcus pyogenes.	Mixed infection.

As stated above, pathogenic germs may be present in the urine without infecting the bladder provided the organ is healthy; but when, from some cause or

other, its resistance is destroyed, the bacteria become active and cystitis results. This is true of all the bacteria with the exception of the gonococcus and the tubercle bacillus, which may, as is now generally conceded, infect a perfectly healthy bladder; in other words, these organisms require no predisposing cause to prepare the walls of the bladder for their lodgment and development.

Channels of Infection.—The various channels through which pathogenic organisms gain entrance to the bladder may be classified as follows:

The urethra.	Adjacent organs.
The ureters.	The blood.

The Urethra.—This is the most frequent channel of entrance into the bladder for pathogenic organisms. The direct relations of the urethra with the vulva, and indirectly with the vagina, the uterus, and the anal region, as well as the shortness and dilatability of its canal, render it especially liable to become secondarily involved when the surrounding parts are the seat of an infection. On the other hand, the bacteria do not always gain a permanent foothold in the urethra, for the reasons that the canal is very short and it is being constantly flushed with an acid urine that exerts an inhibitory action upon a large majority of the pathogenic germs. If, however, the bacteria become permanently lodged in the urethral canal, they may gain entrance into the bladder either by continuity or on a sterilized instrument to which they adhere as it passes through the urethra. Again, germs may be carried through the urethra into the bladder on a septic catheter or some other instrument or on a foreign object introduced by the patient herself; and, finally, a sterilized instrument may become septic before entering the urethra by contact with infected surfaces about the external meatus.

The Ureters.—The ureters not infrequently convey bacteria from the kidneys into the bladder. This method of infection is observed in pyonephritis, in renal tuberculosis, and in acute infectious diseases in which the germs are eliminated by the kidneys without becoming involved themselves and carried by the urine into the bladder.

Adjacent Organs.—Cystitis may be caused by the bladder becoming adherent to a neighboring organ which is the seat of a septic inflammation. Thus, in suppurative lesions of the pelvic or abdominal cavity bacteria may pass through the adhesions and attack the bladder or a purulent collection may rupture into the organ and cause infection. And, finally, the colon bacillus may pass from the rectum, the intestine, or the vermiform appendix if any one of these organs becomes adherent to the bladder.

The Blood.—The infection may be carried by the blood-current into the bladder walls and deposited in the form of small septic emboli or as free germs. This method of infection is demonstrated by the presence of small multiple abscesses in the bladder wall and by the occurrence of primary vesical tuberculosis.

Reaction of the Urine.—The reaction of the urine in cystitis depends upon the variety of the pathogenic organism causing the infection. Some of these bacteria have the power of decomposing urea, and the urine therefore becomes alkaline; others, again, have no such action, and consequently the urine remains acid.

The reaction of the urine is acid and not alkaline in the majority of cases of cystitis.

The effect of the various bacteria on urea and the reaction of the urine are summarized as follows:

No action on Urea: Urine acid.

Colon bacillus.
Gonococcus.
Streptococcus pyogenes.
Tubercle bacillus.
Typhoid bacillus.

Decompose Urea: Urine alkaline.

Proteus vulgaris.
Staphylococcus pyogenes.

Urine Acid or Alkaline.

Mixed infections.

Pathologic Changes.—Marked structural changes in cystitis are the exception rather than the rule in women. This is due to the shortness and dilatability of the urethra, which allow free and constant drainage of the bladder, and consequently there is less tendency of the inflammation becoming virulent in the female than in the male.

In the *mild forms* of cystitis the inflammation is usually limited to the vesical triangle or to a small area around one of the ureteral openings; in the *severe varieties* the lesions are scattered generally over the mucosa; and in the *virulent types* of the affection the whole mucous lining of the bladder is involved.

Acute Stages.—In the *mild forms* of the disease the vesical triangle is hyperemic and the surface is covered with a slight mucous secretion.

In the *severe varieties* the mucous membrane of the bladder is swollen, edematous, and hyperemic, and later, as the inflammation develops, the swelling increases and the surface is covered with a profuse mucopurulent discharge. The epithelium is exfoliated in places and small denuded areas, which have a tendency to bleed, are scattered over the whole inner surface of the bladder.

In the *virulent types* of the disease the inflammation is intense from the beginning and rapidly becomes diffuse, involving not only the mucous membrane but the deeper structures as well. The inflammation in these cases often becomes purulent in character (*suppurative cystitis*) and abscesses form in the bladder wall which may either rupture into the cavity of the organ and leave deep, ragged ulcers, or they may cause a perforation and discharge their contents into the abdominal cavity. In other instances a whitish-gray or yellow membrane forms over the inflamed areas (*exudative*, *diphtheric*, *membranous*, *fibrinous*, or *croupous cystitis*) which is caused by necrotic changes in the bladder mucosa and which in very severe cases involves the muscular and peritoneal coats as well. The exudate is apt to break down and either leave a deep irregular ulcer or cause a perforation of the bladder wall. In fatal cases the whole bladder may become a foul sloughing mass. And, finally, the inflammatory reaction may result in a partial or complete exfoliation or detachment of the mucous membrane of the bladder (*exfoliative cystitis*) which is discharged with the urine in small pieces or remains within the cavity of the organ as a foreign body. In very grave forms of the disease a portion of the muscular coat may be detached with the mucosa.

The adjacent organs are apt to be infected by the direct extension of the disease in virulent types of cystitis, and they consequently soon become firmly matted together by inflammatory adhesions.

The kidneys are especially liable to become involved by direct extension of the infection along the ureters in severe and virulent forms of cystitis, and it is not uncommon to meet cases of pyonephritis from this cause.

Chronic Stages.—The lesions which are present in the mucous membrane during the chronic stages of cystitis are either scattered over the whole surface or confined to a particular area; in the latter case they are generally limited to the

vesical triangle. The rugæ are elevated and assume a polypoid appearance; the mucosa is grayish-white in color and bathed with a more or less profuse muco-purulent secretion; ecchymotic spots occur in various places which later on change to a yellowish hue as the blood is absorbed; and in some cases superficial or deep areas of ulceration are present. If the ulceration is deep, the muscular coat is usually involved and the ulcers are irregular in outline; in rare instances the only gross lesion present may be a single well-defined area of ulceration—the so-called "*simple*" ulcer of the bladder. Sometimes in cases of chronic cystitis small granular or eroded areas of inflammation, surrounded by healthy mucous membrane, are observed scattered over the whole mucosa or else confined to the base of the bladder. These patches vary in size and bleed readily when irritated.

The muscular coat of the bladder is hypertrophied, its walls are thickened and contracted, and its capacity is consequently more or less diminished.

The ureters and the kidneys are apt to become involved in chronic cystitis. This may result in some cases from an extension of the infection to the ureters and thence to the kidneys. In other cases, however, the vesical openings of the ureters may be more or less constricted by the thickened and hypertrophied bladder wall, and the flow of urine is therefore impeded. Under these conditions the ureters may become dilated or hydronephrosis may develop if the occlusion is complete.

Tubercular Cystitis.—In the beginning the disease is usually circumscribed and located about the ureteral orifices and the trigone, but later on it involves the posterior wall of the bladder, and in some cases the entire organ is affected. At first the mucous membrane is swollen and hyperemic, and small grayish-white tubercles appear upon its surface. As the disease progresses the tubercles soften and break down, leaving small irregular ulcers which are covered with a purulent discharge. The walls of the bladder are thickened, hypertrophied, and contracted and the capacity of the organ is diminished.

Symptoms.—The character and severity of the symptoms of cystitis vary so greatly that it is necessary to study them under the following conditions:

1. Acute Stages:
   - (*a*) Mild type.
   - (*b*) Severe type.
   - (*c*) Virulent type.
2. Chronic Stages.

Acute Stages.—During the early stages of the disease the symptoms depend largely upon the severity of the infection, and while there is a general similarity, yet there are distinct and marked differences which must be considered.

Mild Type.—The symptoms are essentially *local* and there is usually an absence of fever.

The disease manifests itself by *frequent micturition*, *vesical tenesmus*, *pain*, and *urinary changes*.

There is always a frequent desire to urinate, and the patient usually suffers great annoyance from this symptom. The irritability of the bladder is not acute, and while the tenesmus is generally distressing, there is an absence of the intense suffering which is so characteristic of severer types of the disease. The patient complains more or less of a burning or smarting sensation along the urethra and at the base of the bladder during and immediately after the act of micturition. This feeling, however, soon subsides and does not return until the bladder is emptied again. There is also a constant feeling of soreness or tenderness at the neck of the bladder, which is more acute when the patient is in the erect position than when she is lying down. The urinary changes are not marked; the urine

is usually high colored or slightly opaque; its specific gravity varies from 1.005 to 1.020, and it throws down a small deposit on standing.

Severe Type.—In this form of the disease the symptoms are both *local* and *general* in character.

The *local* symptoms manifest themselves by *frequent micturition, vesical tenesmus, pain, hematuria,* and *urinary changes.*

The desire to urinate is almost constant day and night, and the patient becomes worn out by the frequency of the calls to use the urinal. The vesical tenesmus is acute and agonizing, and at times the muscular spasms of the bladder are so constant and urgent that the patient is compelled to remain for hours upon the urinal, suffering the most severe pain and distress. The tenesmus is not always relieved after urinating, and there is often a sensation of a few drops of urine remaining in the bladder, which causes the patient to make violent bearing-down efforts to expel. Constant and severe pain or soreness in the suprapubic region is a prominent and persistent symptom of the affection. It may radiate at times to the perineum and the sacral region, or along the urethra, down the thighs and into the groins. It is increased in severity when the bladder contains urine and when the patient assumes the erect position. The slightest pressure over the abdomen aggravates the pain, and the patient usually lies in bed with the legs drawn up to lessen the tension of the abdominal muscles. The presence of blood in the urine, or hematuria, is a common symptom of the disease, and it usually manifests itself by a few drops escaping after urination. In some cases, however, a small quantity of blood may be ejected with the urine, and in other instances a more or less copious hemorrhage occurs during micturition. The urinary changes are marked. The urine is turbid or opaque in appearance or it may be reddish in color from the presence of blood. It contains pus, mucus, and epithelial cells; also numerous bacteria (see *exciting causes of cystitis*); and if its reaction is alkaline, amorphous phosphates, ammonium urate, and triple phosphates are also usually present. On standing, a sediment forms in the bottom of the vessel which is dirty white or red in color and consists of the abnormal constituents of the urine. If the reaction is alkaline, the urine has a foul or fetid odor.

The *general* symptoms manifest themselves by *fever, rigor,* and *increased pulse-rate.*

The elevation of temperature is not marked in this form of cystitis, and the disease may or may not be ushered in by a chill. If an initial rigor occurs, it is seldom repeated during the subsequent course of the affection. The fever and the increased pulse-rate persist during the active stages of the inflammation.

Virulent Type.—In this form of the disease the symptoms are both *local* and *general* in character and present the usual manifestations of profound septicemia. Virulent types of cystitis are very seldom observed except in puerperal women, and they are usually associated with infection in some portion of the genital tract.

The *local* symptoms manifest themselves by *frequent micturition, vesical tenesmus, pain, hematuria,* and *urinary changes.*

These symptoms are more severe and acute than in the foregoing type of cystitis. The suprapubic and pelvic pains are intense, and general peritonitis may intervene when the inflammation becomes suppurative or diphtheric in character and the bladder wall is perforated. Hematuria is a prominent symptom, and not infrequently profuse hemorrhages occur from the bladder, especially when the disease assumes an exfoliative or diphtheric type. The urinary changes are marked. In addition to those described as occurring in the foregoing type of cystitis, we find that the urine is overloaded with pus, broken-down decompos-

ing tissue, and shreds or small pieces of detached mucous membrane. Retention of urine may occur in the exfoliative form of the disease from the urethral opening being blocked by a piece of the detached mucous membrane, and in some cases the bladder may become enormously distended before the condition is discovered. It is well to bear in mind, in attempting to empty the bladder in these cases with a catheter, that small pieces of tissue may occlude the instrument and prevent the escape of urine.

The *general* symptoms manifest themselves by *rigors*, *fever*, *rapid pulse*, and *the typhoid state*.

The general manifestations of profound septic infection are present from the beginning, and the affection usually tends toward a fatal ending.

The disease usually begins with an initial chill, which is repeated at varying intervals during the attack; the temperature ranges from 101° to 105° F.; and the pulse gradually increases in frequency as the symptoms become grave. If the condition of the patient goes from bad to worse, the urine lessens in quantity and may be suppressed; uremic symptoms manifest themselves; and the patient gradually sinks into the typhoid state, which is characterized by a dry, brown tongue; mild delirium; nervous and muscular twitching; headache; gastric disturbances; and coma.

Chronic Stages.—In this form of the disease the symptoms are both *local* and *general* in character.

The local symptoms manifest themselves by *frequent micturition*, *vesical tenesmus*, *pain*, and *urinary changes*.

Frequent urination is the most common symptom in the majority of the cases of chronic cystitis, and the patient is compelled to empty her bladder at short intervals during the day and night. The act of micturition is followed by tenesmus, which is sometimes very severe, but, as a rule, it does not cause the agonizing suffering experienced in the acute stages. The patient complains of suprapubic pain and tenderness, which is aggravated when she assumes the erect position or strains at stool. The pain, however, is not very severe except in those cases in which the vesical lesions are ulcerative in character, when the bladder naturally becomes extremely sensitive and tender. The urinary changes are marked. The urine is highly irritant in character and has a very offensive, fetid odor; it is turbid or opaque in appearance and may be colored red from the presence of blood in the ulcerative forms of the disease; it throws down a dirty white deposit on standing for several hours, and the specific gravity ranges between 1.015 and 1.020. The sediment contains pus, mucus, epithelial cells, shreds of connective tissue, and numerous bacteria; and if the reaction of the urine is alkaline, amorphous phosphates, ammonium urate, and triple phosphates are also usually present.

The *general* symptoms manifest themselves by *neurasthenia*, *malnutrition*, and *loss of weight* and *strength*.

These conditions are due to the long-continued suffering, the loss of rest, and the constant annoyance to which the patient is subjected.

Physical Signs.—The physical signs in cystitis are elicited by (*a*) *touch;* (*b*) *the cystoscope;* and (*c*) *a chemic* and *microscopic examination* of the urine.

Touch.—The location of the pain depends upon the situation of the lesions.

In the *acute mild type* of cystitis pressure over the base of the bladder through the vagina causes pain; in the *severe type* the whole bladder is more or less tender upon touch; and in the *virulent type* the entire organ is so sensitive that it is impossible to palpate it without using an anesthetic.

In the *chronic stages* of the disease the location of the pain likewise depends upon the situation of the lesions. If the trigone alone is involved, pressure over

the base of the bladder causes pain; and if the lesions are scattered, the whole bladder is more or less tender upon palpation. The pain, as a rule, is not severe, and in most instances the bladder feels sore only when pressure is made upon it by the examining fingers; in the ulcerative forms of chronic cystitis, however, the organ is so sensitive that an examination cannot be made without an anesthetic.

The Cystoscope.—Inspection of the bladder through the cystoscope reveals the pathologic changes which are characteristic of the various types of the disease.

Chemic and Microscopic Examinations.—The character of the abnormal constituents of the urine is determined by a chemic analysis and a microscopic examination.

Differential Diagnosis.—Cystitis must be distinguished from the following affections:

Infection of the ureters and kidneys.
Neurosis of the bladder.
Contraction of the bladder.
Vesico-urethral fissure.
Stone or foreign bodies.

The symptoms caused by these pathologic conditions (*pus in the urine, frequent and painful micturition, and tenesmus*) are wholly or partially similar to those of cystitis, and a mistake in the diagnosis may readily be made if the examination is carelessly or ignorantly conducted. I shall not refer in any way to the subjective symptoms in considering these affections, as the differential diagnosis is based entirely upon the physical signs.

It is important to bear in mind that frequent urination is often caused by a displaced uterus pulling upon the neck of the bladder or by the pressure of an extravesical tumor. In these cases the bladder walls are normal and there is no evidence whatever of disease, the frequency of urination being due simply to lessened capacity from the uterus dragging upon the organ or the tumor crowding it.

Infection of the Ureters and Kidneys.—A cystoscopic examination reveals a normal bladder wall, and pus may be seen oozing from one or both of the ureteral orifices.

Neurosis of the Bladder.—A cystoscopic examination reveals a normal bladder wall, and the urine is found to contain no abnormal constituents, as in the case of cystitis.

Contraction of the Bladder.—A cystoscopic examination reveals no local lesions of cystitis; the urine is normal; and the capacity of the bladder is found to be decidedly diminished by measuring the quantity of fluid that it will contain.

Vesico-urethral Fissure.—The characteristic lesion of this affection is found at the vesico-urethral juncture and the urine and the bladder walls are normal unless cystitis is present.

Stone or Foreign Bodies.—Bimanual palpation and a cystoscopic examination will reveal the presence of the foreign body; there is nearly always a coexisting cystitis.

Prognosis.—In the **acute mild type** of cystitis the prognosis is good and the disease usually disappears in from one to three weeks under appropriate treatment; there is but little danger of the ureters becoming infected.

In the **acute severe type** the prognosis must be guarded on account of the danger of the ureters and the kidneys becoming involved.

In the **acute virulent type** the prognosis is always very grave. The patient may die within a few days from septicemia or at a later period from involvement of the kidneys. Suppression of urine is a common symptom and many deaths result from this cause. Perforation of the bladder may occur in some cases and

a rapidly fatal peritonitis ensue. Exfoliative cystitis is the most virulent form of the disease and almost invariably has a fatal ending.

The **chronic forms** of cystitis are often difficult to cure and the disease may last indefinitely despite everything that may be done for its relief. The ureters and the kidneys are apt to become involved by the direct extension of the infection or by occlusion of the ureteral orifices from the hypertrophied and thickened condition of the bladder walls.

Treatment.—The treatment of cystitis is based upon the stage of the disease, the severity of the infection, and the character of the lesions, and consequently no two cases are managed precisely alike.

The treatment as a whole is conveniently divided into: (1) the general, (2) the local, and (3) the operative.

General Treatment.—Under this heading we include:

Rest in bed.
The diet and drink.
The care of the bowels.
The condition of the urine.
General and local baths.
Compresses.
Special remedies.

Rest in Bed.—Rest is one of the most important factors in the treatment, and the patient should be put to bed at once and kept in the recumbent posture so long as she suffers from local pain and vesical tenesmus. Under these conditions the bladder is not crowded by the weight of the intestines, nor by the tension of the abdominal muscles, and hence the inflamed organ is free from this source of irritation.

The Diet and Drink.—These subjects are fully discussed under the treatment of acute urethritis on page 594.

The Care of the Bowels.—The bowels should be kept in a semi-fluid state by the daily administration of a saline, and nothing is better for this purpose than Epsom or Rochelle salts or a solution of the citrate of magnesium.

The Condition of the Urine.—In addition to rendering the urine bland and innocuous by carefully regulating the patient's diet and drink, we must correct any abnormality in its reaction, and thus lessen its irritating properties. If the urine is strongly acid, the patient should drink alkaline mineral waters and take internally potassium citrate, carbonate, or acetate, or the solution of potassa; but if it is alkaline, she should be given boric acid, salol, benzoic acid, or ammonium benzoate. Good results are obtained by combining one or more of these remedies with the infusion of buchu or uva ursi. After the inflammation begins to subside cubebs, copaiba, and the oil of sandalwood should be given for their curative and sedative action upon the diseased mucous membrane.

General and Local Baths.—The painful and frequent urination, the vesical tenesmus, the pelvic and suprapubic tenderness, and the severity of the inflammation are decidedly relieved by a full hot bath (see p. 83) at bedtime and a hot sitz-bath (see p. 87) once or twice during the day. Beneficial results are also obtained by hot vaginal douches, which may be given two or three times daily. The pain and muscular spasm during micturition are greatly relieved by having the patient sit in a hot sitz-bath while the bladder is being emptied.

Compresses.—Hot compresses (see p. 97) continuously applied for several hours to the vulva and the lower abdomen give the patient marked relief from pain and lessen the frequency of urination and the severity of the tenesmus.

Special Remedies.—A rectal suppository of 3 grains of ichthyol may be used with decided benefit once or twice a day for the relief of pain and tenesmus. If the pain is very severe, it may be necessary to use morphin hypodermically or opium by the bowel. Pain and tenesmus are often promptly relieved by an enema of chloral hydrate, or a suppository of belladonna and opium; and tincture of cannabis indica given by the mouth frequently gives good results when opium is not well borne by the stomach.

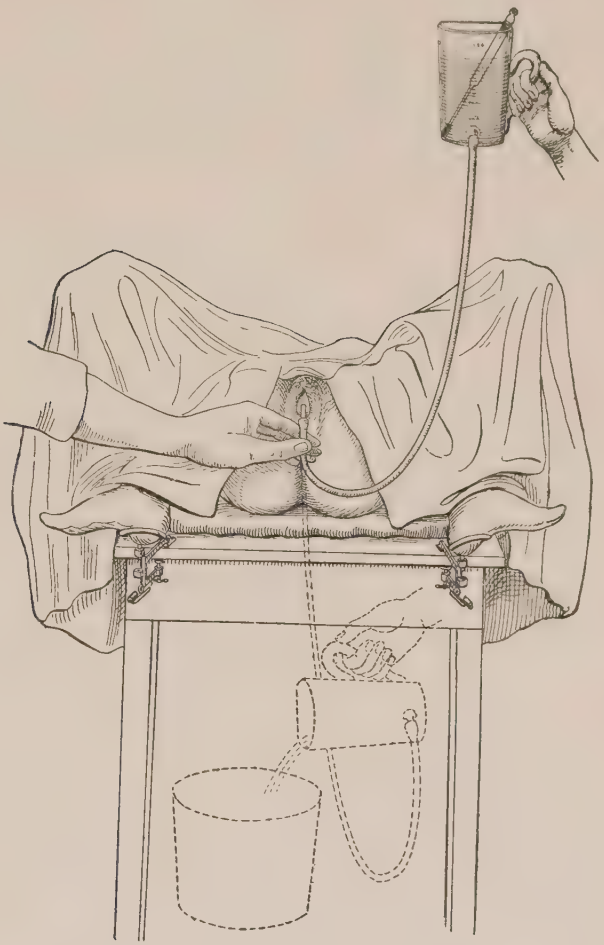


FIG. 583.—LOCAL TREATMENT OF CYSTITIS (page 636).
Shows the method of irrigating the bladder.

The Local Treatment.—Under this heading we include.

Irrigation of the bladder.

Direct applications to the interior of the bladder.

Irrigation of the Bladder.—The apparatus consists of a glass catheter, four feet of rubber tubing, a graduated glass reservoir, and a thermometer (Fig. 574).

The antiseptic solutions which are most useful for purposes of irrigation are: Corrosive sublimate, 1:20,000 to 1:5000; permanganate of potassium, 1 to 4 per cent.; and hydrogen peroxid, 20 to 50 per cent.

The following remedies in solution have a curative and soothing effect upon the inflamed mucous membrane: Nitrate of silver, 1 to 2 per cent.; boric acid, a saturated solution; creolin, 0.5 to 1 per cent.; and lysol, 0.5 to 1 per cent.

Technic.—The patient is placed in the dorsal position with the hips resting on a surgical pad and the external parts thoroughly sterilized. The urine is then drawn with a glass catheter and the reservoir filled with normal salt solution (110° F.). The physician now exposes the meatus and passes the catheter directly into the bladder. The reservoir is then held about four feet above the table and the solution allowed to flow into the bladder until the patient complains of overdistention. The reservoir is now lowered below the level of the bladder and the fluid allowed to flow into a bucket on the floor. The reservoir is then refilled, and

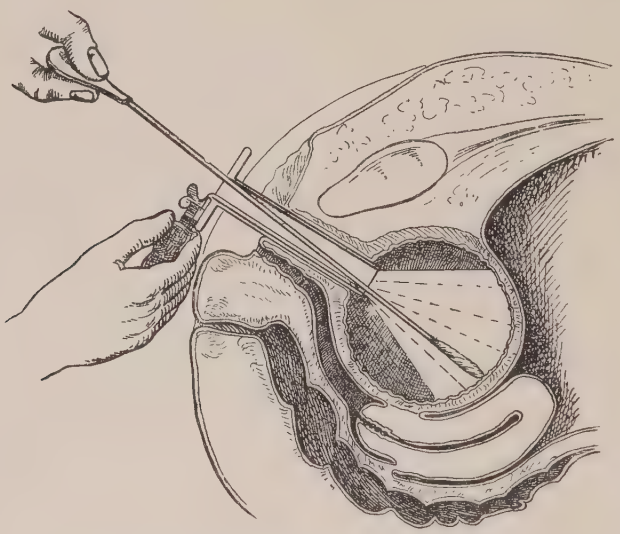


FIG. 584.—LOCAL TREATMENT OF CYSTITIS.
Shows the method of making a direct application to the interior of the bladder.

the process repeated several times until the solution comes away clear. Having in this way thoroughly washed out the bladder, the reservoir is filled with a medicated fluid and the irrigation continued in the same manner. After douching the bladder three or four times it is finally irrigated once or twice with hot normal salt solution to prevent the danger of poisoning by absorption (Fig. 583).

When a solution of nitrate of silver or permanganate of potassium is employed, the bladder is first washed out with plain sterile water, and after the medicated douche is given it is immediately irrigated with normal salt solution.

Argyrol has lately come into prominence in the treatment of cystitis, and excellent results have followed its use. It should be employed daily as follows: Wash the bladder out thoroughly with warm sterile water as described above and then inject one drachm of a 20 per cent. aqueous solution of argyrol with a long-nozzle hard-rubber syringe. The solution is allowed to remain in the bladder and is eventually expelled when the patient urinates.

Direct Applications to the Interior of the Bladder.

—Direct applications are generally employed in conjunction with irrigation of the bladder and are indicated when the lesions are localized. The medicament is applied directly to the diseased areas through a cystoscope. Nitrate of silver is the most useful remedy to employ and may be applied either in the form of a solution (2 to 10 per cent.) upon an applicator wound with cotton or the solid stick held in the grasp of alligator-jaw forceps.

Before applying the silver the diseased areas should be wiped clean with a pledget of absorbent cotton held in the grasp of the alligator-jaw forceps, and after the application the bladder should be irrigated with hot normal salt solution. The applications should be made every five or six days until the lesions disappear and the mucosa returns to its normal condition.

The Operative Treatment.—The only practical operation for the relief of cystitis is *vaginal cystotomy*, which consists in making an artificial vesicovaginal fistula. The operative technic is fully described on page 970, and as it may be necessary to keep the fistulous opening patulous for an indefinite length of time, the mucous membrane of the bladder should be united to the mucous membrane of the vagina by interrupted sutures of catgut. When the patient gets out of bed, the urine may be allowed to collect on an absorbent vulvar pad, or she may wear a specially constructed urinal for the purpose (see Fig. 764). It is important for the patient to keep herself scrupulously clean; otherwise the parts are likely to become inflamed and excoriated.

The operation is indicated in acute cases of cystitis when general and local treatment fails to effect a cure; in all chronic cases which resist ordinary measures for their relief; and in the virulent forms of the disease when drainage or the removal of detached and sloughing tissue is imperatively demanded.

The fistulous opening which results from the operation of vaginal cystotomy affords immediate relief to the patient by giving the bladder complete rest; it also establishes free drainage and facilitates carrying out the local treatment. The bladder is douched by pouring the solution from a large pitcher into the irrigating reservoir and allowing the fluid to escape through the fistulous opening into the vagina.

After the local lesions have disappeared, in the course of several weeks or months, the vesicovaginal opening is permanently closed by operative means. (For technic see p. 758.)

Treatment of the Different Types.—**Acute Mild of Type of Cystitis.**—The infection in this form of the disease is so mild in character and the danger of the ureters or the kidneys becoming involved so slight that there is seldom, if ever, any necessity to resort to local measures, and hence the patient is placed upon the general treatment described above, which usually effects a cure in from one to three weeks.

Acute Severe Type of Cystitis.—In this form of the disease the treatment is both *general* and *local* in character.

General Treatment.—This is the same as described above.

Local Treatment.—The infection in these cases is of a severe type and there is imminent danger of the ureters or the kidneys becoming involved. No time should therefore be lost in destroying the pathogenic organisms causing the inflammation and thus preventing an extension of the infection.

This is accomplished by irrigating the bladder once or twice a day with an antiseptic solution for a period of about one week and then using nitrate of silver or one of the curative and soothing remedies already referred to. In the majority of the cases it is well to begin with corrosive sublimate, and after a few days to employ a weak solution of nitrate of silver, which may later on be discontinued and creolin or lysol substituted.

Argyrol used as described above is very efficacious in these cases.

If the disease is not cured by the treatment and it passes into the chronic stage, it may be necessary to make direct applications to the interior of the bladder or to put the organ at rest and secure free drainage by performing a vaginal cystotomy. In the latter case the bladder should be irrigated once or twice a day with creolin, lysol, or sulphate of copper, and the localized lesions painted with a strong solution of nitrate of silver. Later on, when the symptoms disappear and the mucosa returns to its normal condition, the fistulous opening should be permanently closed and the bladder restored to its original state.

Acute Virulent Type of Cystitis.—In this form of the disease the treatment is both *general* and *local* in character.

General Treatment.—The most important factor to consider is the profound sepsis from which the patient is suffering, and consequently the general treatment which is recommended in other types of the disease is contraindicated in these cases. In other words, the grave condition of the patient demands that the treatment be supportive in character irrespective of its effect upon the condition of the urine and the local inflammation of the bladder.

The patient is therefore placed upon a highly concentrated liquid diet and alcohol and strychnin administered according to the indications. The bowels should be well flushed in the beginning with a saline laxative or calomel and kept open by the daily use of a rectal enema. The occasional administration of a saline, such as a solution of the citrate of magnesium, assists materially in the elimination of the infection from the system and lessens the danger of a fatal ending. The local pain and tenesmus are relieved by hot fomentations placed over the vulva and lower abdomen and by hot vaginal douches. The internal administration of tincture of cannabis indica and the use of ichthyol suppositories are also serviceable for the same purposes.

This plan of treatment should be continued until the general manifestations of the disease disappear and the pulse and the temperature become normal. The case may then be considered as a *severe type* of cystitis and treated accordingly.

Local Treatment.—The two cardinal principles upon which the treatment is based are drainage and sterilization. The first is accomplished by performing a vaginal cystotomy and the second by employing antiseptic douches. The artificial opening between the bladder and the vagina must be sufficiently large to allow free drainage and the removal of sloughing tissue. The bladder should be irrigated twice a day with corrosive sublimate followed by normal salt solution. Later on, when the disease is under control and the pulse and the temperature have become normal, the case may be treated as a *severe type* of cystitis.

Chronic Cystitis.—In this form of the disease the treatment is both *general* and *local* in character.

General Treatment.—This is the same as described above, except that it is not absolutely necessary for the patient to remain in bed, although if she can afford to do so the symptoms would be less severe and the cure materially hastened.

Local Treatment.—*This is based entirely upon the cystoscopic findings, and hence a thorough examination of the vesical mucous membrane should be made at once in every case.* In some instances the local lesions may be cured by irrigation of the bladder and direct applications to the diseased areas; in others, again, the cystoscopic examination will demonstrate that no benefit will follow the employment of these procedures unless a vaginal cystotomy is also performed and the bladder put at rest and free drainage established.

In some of the cases, therefore, it will be necessary to make an artificial vesicovaginal fistula and then to wash out the bladder with medicated solutions

and apply nitrate of silver directly to the localized lesions. The solutions which I have found most useful in these cases are corrosive sublimate, nitrate of silver, permanganate of potassium, creolin, and lysol.

Argyrol is indicated in cases of chronic cystitis, and good results have followed its use. The bladder should be irrigated with warm sterile water and one drachm of a 20 per cent. aqueous solution injected as described above.

After the disease is cured the fistulous opening between the bladder and the vagina should be permanently closed in the usual way (see p. 758).

IRRITABILITY OF THE BLADDER.

Definition.—Under this term are included all cases of vesical hyperesthesia in which no organic lesion of the bladder is present.

Pathology.—A cystoscopic examination of the bladder may reveal in some cases a slight hyperemia of the trigone or the mucous membrane surrounding the orifices of the ureters, but in the majority of instances this condition is not present and the mucosa is found to be absolutely normal.

Causes.—The affection is very common in women and in the majority of cases no cause whatever can be discovered.

The chief causes are:

Neurasthenia.	Lithemia.
Hysteria.	Sexual irregularities.
Malaria.	Diseases of neighboring organs.

The disease is most frequently observed in women in whom the neurotic and hysteric temperaments are well marked and who become neurasthenic from overwork, bad hygiene, dyspepsia, mental anxiety, and other causes. These women often suffer from neuralgic pains in various parts of the body; from backache and headache; they are badly nourished and suffer from menstrual irregularities; they are dyspeptic, peevish, and irritable; and they sometimes develop symptoms of melancholia.

An irritable condition of the bladder is occasionally observed in cases of malarial intoxication, and the vesical distress is usually most severe during the afternoon and evening.

The bladder is often irritated by a highly concentrated state of the urine in lithemia, and the patient suffers from a constant desire to urinate.

Excessive sexual intercourse or masturbation produces congestion and irritability of all the pelvic organs, and the patient suffers from extreme mental and physical weakness. The bladder under these circumstances becomes enfeebled and hyperesthetic and there is a constant sense of vesical fullness which produces an incessant desire to urinate.

An irritable condition of the bladder is frequently observed in women suffering from diseases of neighboring organs. Sometimes a pelvic or abdominal tumor may press upon the bladder and diminish its holding capacity; in other cases a general pelvic inflammation may be associated with vesical irritability; and, finally, the reflex disturbances which often accompany hemorrhoids, vaginismus, and other like disorders, may produce hyperesthesia and a frequent desire to urinate.

Symptoms.—In the largest proportion of cases of irritability of the bladder the only symptom present is a frequent desire to urinate, which is often extremely annoying to the patient and interferes with her rest at night.

In some instances, however, there is also a feeling of weight or pressure and a bearing-down sensation in the region of the bladder, which are aggravated when the patient assumes the erect position; in others the act of urination may be pain-

ful and accompanied by more or less tenesmus; again, the pain may be more severe immediately after than during micturition; and, finally, the bladder may be so irritable that it will not tolerate the presence of even a small amount of urine.

The loss of sleep and the annoyance caused by the frequent act of urination, as well as the local distress and the original vicious condition of the system, gradually undermine the general health, and eventually the patient becomes profoundly neurasthenic.

The urine may be normal in character, or it may be highly concentrated or diluted; but it does not show the peculiar alterations met in cystitis.

Diagnosis.—The symptoms are not pathognomonic and the diagnosis must therefore be based upon a microscopic and chemic analysis of the urine, a cystoscopic examination of the interior of the bladder, and a thorough consideration of the causes of the affection.

As stated above, the urine may be concentrated or diluted, but it never possesses the peculiar physical and chemic properties met in cystitis.

The vesical mucous membrane is normal and the bladder does not contain a foreign body or a calculus.

As the irritability of the bladder is simply a local manifestation of a general condition, it is most important to determine the cause in each case, and we should therefore bear in mind that the trouble is often associated with neurasthenia, hysteria, malaria, and lithemia, and that it may also result from sexual irregularities or from diseases of adjacent organs.

Prognosis.—If the cause can be discovered and removed, the prognosis is good; otherwise the ultimate cure of the patient is extremely doubtful. The length of time the affection has lasted, as well as the condition of the patient's nervous system, has a decided influence upon the prognosis. Unfortunately many of these patients suffer from profound neurasthenia, which is continually aggravated by the local condition, and if the vesical irritability cannot be removed there is danger of melancholia developing.

Treatment.—This is divided into:

The treatment of the cause.
The symptomatic treatment.
The operative and local treatment.

The Treatment of the Cause.—We should always endeavor to discover and, if possible, remove the cause. In the majority of instances the treatment will be based upon the general medical principles, which are fully discussed in treatises on the practice of medicine, and which need not, therefore, be referred to here. Under this heading we naturally include the treatment of such conditions as neurasthenia, hysteria, malaria, and lithemia, when they are present as causes of irritable bladder.

Sexual irregularities must be corrected. Excessive coitus or masturbation, as we have already seen, causes congestion and irritation of all the pelvic organs, and the vesical irritability cannot be cured so long as either of these habits continues. The diet in these cases should be nourishing but not stimulating; the bowels regulated by a mild laxative; a cold plunge, spray, or sponge bath taken every morning, and a cold sitz-bath given at night before retiring; and a course of outdoor and indoor exercises prescribed. The reading of erotic literature or seeing sensational plays must be forbidden and the patient should refrain from the use of alcohol in any form. Good results are obtained from the sedative action of bromid of sodium or potassium, which should be given in full doses three times a day and at bedtime.

If the vesical irritability is found to be dependent upon some pathologic con-

dition in one of the adjacent organs or structures, we must remove the cause by treating the lesion upon the principles laid down in discussing pelvic diseases.

The Symptomatic Treatment.—It is often necessary in treating cases of irritable bladder to use certain remedies for the purpose of lessening the frequency of urination without any reference whatever to their curative action upon the disease. A solution containing from 10 to 15 grains of chloral hydrate injected into the rectum at bedtime often controls the vesical irritability and gives the patient several hours of undisturbed sleep. Bromid of sodium (gr. xxx) is also an efficient sedative and acts very beneficially in some cases. Good results are also obtained from rectal suppositories containing belladonna, hyoscyamus, ichthyol, or iodoform; opium should never be employed on account of the danger of the patient forming the drug-habit.

Small doses of strychnin and the internal administration of valerian, asafetida, or belladonna usually lessen the irritability and tone up the bladder.

The urine should be kept well diluted by drinking plenty of distilled water and by administering the infusion of pareira brava or buchu. If the reaction of the urine is abnormal, it should be corrected by the remedies that are recommended in the treatment of cystitis (see p. 634).

The Operative and Local Treatment.—Forcible dilatation of the urethra should be performed at once in every case as a routine, empiric plan of treatment irrespective of the cause of the affection. This operation alone often results in a complete cure of the vesical irritability and the disappearance of the frequent desire to urinate.

The direct application of a solution of the nitrate of silver (2 to 10 per cent.) to the base of the bladder and the vesico-urethral juncture is sometimes followed by most gratifying results when divulsion of the urethra fails to relieve the symptoms.

CONTRACTION OF THE LUMEN OF THE BLADDER.

Definition.—By this term is meant a condition of the bladder in which its caliber is lessened and its holding capacity is diminished.

Causes.—This affection is caused by thickening, hypertrophy, contraction, or atrophy of the walls of the bladder. It may therefore result from a previous attack of cystitis in which the caliber of the bladder is diminished by the thickened, hypertrophied, or contracted condition of the walls of the organ. In these cases the bladder has also lost its elasticity, and consequently as the urine accumulates its walls do not distend and increase the capacity of the organ. Atrophy always follows disuse, and contraction therefore often results from the frequent act of urination which accompanies cases of chronic cystitis, irritability of the bladder, and the enuresis of childhood when it continues after puberty. In these cases the bladder becomes weakened and the muscular tone of its walls is lost to a greater or lesser extent because the urine cannot accumulate in sufficient quantity to distend and exercise the organ, as in health.

Contraction of the bladder is frequently caused by calculi or neoplasms, and it may also result from an operation upon the organ in which a portion of its wall is resected or cicatricial tissue subsequently forms.

Symptoms.—Frequent urination is the only manifestation of the affection. The constant desire to urinate is not due to vesical irritability but to the diminished capacity of the bladder, which becomes filled and requires emptying when only a few ounces of urine have accumulated. The frequency of the desire to urinate depends, therefore, upon the amount of urine the bladder will accommodate, and in some cases the quantity is so slight that the patient is constantly using the urinal. The act of urination is not attended by pain or tenesmus and

the suprapubic and pelvic soreness which are constant symptoms of cystitis are entirely absent.

Diagnosis.—A cystoscopic examination reveals no local lesions; the urine is normal; and the capacity of the bladder is found to be decidedly lessened.

The capacity is determined by having the patient void her urine naturally and measuring the quantity of normal salt solution the bladder will contain. To accomplish this the irrigating apparatus used in the treatment of cystitis (see p. 635) is employed and the reservoir held about four feet above the bed or table while the solution is allowed to flow into the bladder until the patient complains of distention. The level of the fluid in the reservoir is now compared with the original level and the difference in the quantity between the two will indicate the holding capacity of the bladder.

Prognosis.—The prognosis, as a rule, is good, and in the majority of

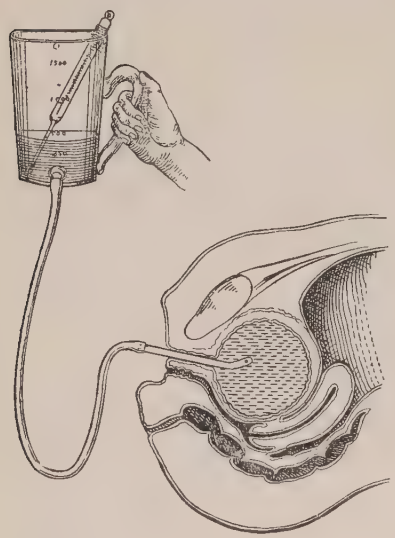


FIG. 585.

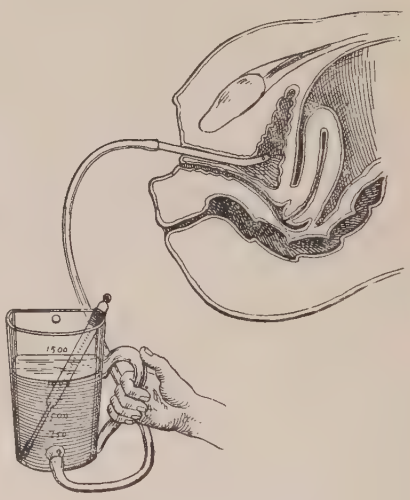


FIG. 586.

TREATMENT OF CONTRACTION OF THE LUMEN OF THE BLADDER.

Fig. 585 shows the bladder distended with fluid; Fig. 586 shows the reservoir lowered below the level of the urethra and the bladder empty.

cases the bladder is practically restored to its normal condition after a few weeks or months of treatment.

Treatment.—The object of the treatment is to increase the capacity of the bladder by alternately distending and relaxing the walls of the organ by hydrostatic pressure.

The patient is placed in the dorsal position on a table or a bed; the vulva sterilized; and the urine drawn off with a catheter. The reservoir of the irrigating apparatus is then filled with normal salt solution (100° F.) and a glass catheter introduced into the bladder. The reservoir is then raised about four feet above the bed and the solution allowed to flow into the bladder, and when the patient complains of distention it is lowered below the level of the urethra. The reservoir is repeatedly raised and lowered in this way for five or ten minutes, after which time the catheter is disconnected and the salt solution allowed to escape from the bladder.

The treatment should be given every day for several months, or until the capacity of the bladder is sufficiently increased to relieve the abnormal frequency of urination.

The capacity of the bladder should be measured at the beginning of the treatment and a daily record kept to note the improvement in the case.

VESICAL CALCULUS.

Causes.—The causes of vesical calculi are usually the same in both sexes, but owing to the anatomic relations and construction of the female bladder and urethra it is necessary to point out certain causative factors that are peculiar to women.

Vesical calculi are rarely met in women owing to the shortness and dilatability of their urethral canal. A secondary calculus is an extremely infrequent occurrence, because if a small renal stone should happen to come from the kidney it is usually expelled at once from the bladder and does not remain as a nucleus around which the urinary salts may be deposited. Vesical calculi in women are therefore primary formations, as a rule, and in the majority of the cases, according to Emmet, they occur after the repair of vesical fistulas. He attributes their

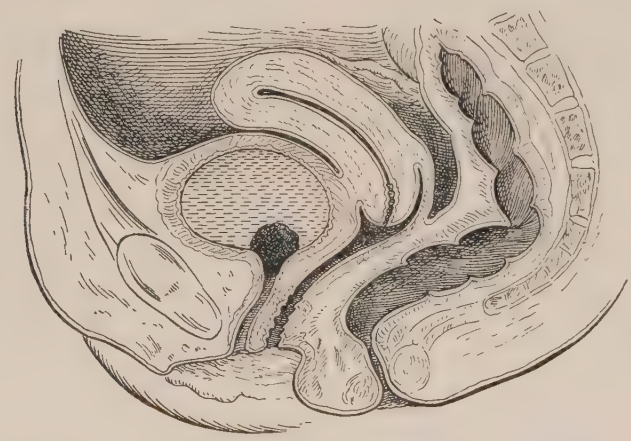


FIG. 587.—SYMPTOMS OF A VESICAL CALCULUS (page 644).
Shows the sudden stoppage of the stream of urine by a small stone temporarily blocking the urethral opening of the bladder during micturition.

occurrence under these circumstances to the fact that the sutures have been improperly introduced to close the fistulous openings, and that instead of passing them only up to the mucous membrane of the bladder they included it, and consequently, being exposed to the urine, the salts are deposited upon them. A cystocele may be a predisposing cause of a calculus owing to the residual urine, which occupies the prolapsed portion of the bladder, undergoing ammoniacal decomposition and containing epithelial cells, mucus, and urinary crystals, which may form a nucleus for the development of a stone. And, finally, the urinary salts composing a calculus have been found deposited about a foreign body which had been introduced by the patient herself or overlooked by the physician at the time of an operation, or had ulcerated through into the bladder from an adjacent part.

Symptoms.—The symptoms are not characteristic and they usually resem-

ble those of cystitis. *Frequent urination, pain, vesical tenesmus*, and *hematuria* are the most common manifestations of the affection. Sometimes the patient complains of stoppage of the stream of urine when the stone is small and temporarily obstructs the vesico-urethral opening during the act of urination (Fig. 587). If the stone is large and the accompanying cystitis is severe, the frequency of urination and the vesical tenesmus are marked and distressing, especially during the day. Hematuria is not an infrequent symptom and the patient usually squeezes a few drops of blood out of the urethra after the act of micturition. In some cases blood may be found in the urine, and in others there may be more or less of a free hemorrhage occurring when the bladder is emptied. Besides the local and referred pain, which is caused by the accompanying cystitis, the presence of the stone itself produces a constant dull ache in the suprapubic region which often radiates into the external organs of generation and down the thighs. In

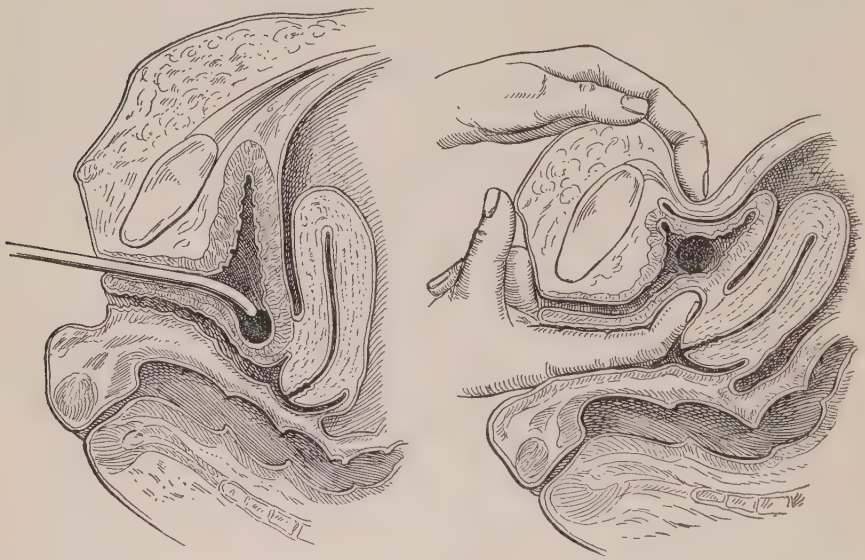


Fig. 588. Fig. 589.

Diagnosis of a Vesical Calculus.

Fig. 588 shows the method of detecting a stone with the sound; Fig. 589 shows the method of recognizing a stone by palpation. Note that the calculus is caught between the external and internal fingers.

young girls suffering from stone the pain and soreness may be felt almost exclusively in the vulva, and the common habit of these patients of constantly scratching the parts should lead the physician to suspect the presence of a vesical calculus. If the stone is irregular or rough in shape, the bladder becomes acutely sensitive, and a sharp, lancinating pain is felt immediately after urination which is often referred to the vulva.

Diagnosis.—The symptoms are not pathognomonic, and the diagnosis must therefore be based upon a physical examination of the bladder. This is accomplished by (*a*) the sound, (*b*) palpation, and (*c*) the cystoscope.

The Sound.—This is one of the best methods of exploring the bladder for stone. When the sound comes in contact with the calculus, a peculiar click is heard, and a grating sensation is imparted to the fingers as the tip of the instrument scrapes over it. We must bear in mind that it is not always possible to

recognize the presence of a stone with the sound, because it may have caused ulceration and become encysted or it may be imbedded in a clot of blood or a mass of lymph; or, again, it may be attached to the anterior wall of the bladder and elude the instrument.

Incrustations of the mucous membrane of the bladder which are due to the deposit of urinary salts in cases of chronic cystitis are readily recognized by the sound and produce a grating noise and sensation as the instrument passes over them.

Palpation.—Owing to the anatomic relations of the female bladder, the presence of a foreign body may readily be detected by bimanual palpation. Introducing two fingers into the vagina and making suprapubic pressure with the fingers of the free hand, the bladder is easily palpated between them, and if a stone is present it can easily be felt.

The Cystoscope.—A cystoscopic examination should always be made, not only for the purpose of eliciting or confirming the diagnosis, but also to determine the condition of the vesical mucous membrane, as cystitis is always associated with a foreign body in the bladder, and it is necessary from the standpoint of treatment to have a definite idea of the character of the lesions.

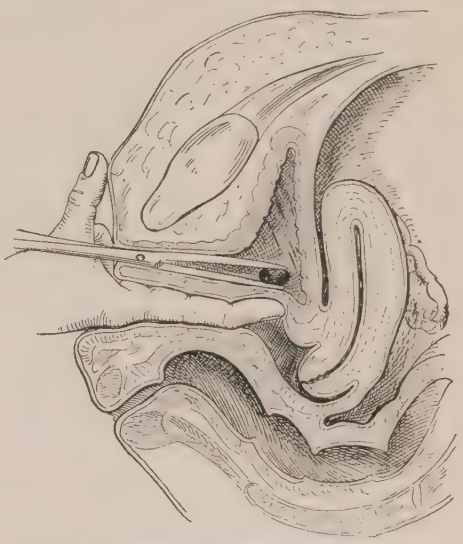


FIG. 590.—TREATMENT OF A VESICAL CALCULUS (page 646). Shows the method of removing a small stone through the urethra with forceps.

Prognosis.—As a rule, the presence of a vesical calculus causes such marked local disturbances that it is detected and removed before structural changes have occurred in the bladder or the kidneys have become involved, and consequently the prognosis under these circumstances is good. If, however, the kidneys have become damaged the prognosis is bad, as the patient may either die from the renal complication shortly after an operation for the removal of the stone or at a later period from the natural progress of the disease. The cystitis which always accompanies vesical calculi generally disappears under appropriate treatment soon after the stone is removed unless structural changes have occurred in the bladder or its walls have become contracted. Even under these conditions, however, a cure is usually effected by treating the chronic cystitis and the contraction of the bladder.

Treatment.—The treatment of vesical calculus is always operative and may be considered under the following headings:

Removal through the urethra.
Litholapaxy.
Vaginal cystotomy.
Suprapubic cystotomy.

Removal through the Urethra.—Owing to the shortness and dilatability of the female urethra a small stone may be removed from the bladder through the urethral canal. As a matter of fact, however, we seldom meet cases in which

this method is advisable, on account of the frequency with which contraindications to the operation are present. Thus, a stone measuring over one-half of an inch in diameter or with a circumference of over one and a half inches should never be removed through the urethra, as it is liable to rupture the sphincter and cause incontinence; a rough, uneven, sharp calculus is likely to tear the vesico-urethral opening and damage the mucous membrane of the urethra; a coexisting cystitis or a vesical neoplasm is always a contraindication; and, finally, the operation should never be performed in girls prior to puberty, as the urethra is too narrow and the tissues too tender to permit of instrumentation.

Operative Technic.—There are two methods by which a stone may be removed from the bladder through the urethra: (1) with forceps and (2) by palpation.

The preliminary steps in both of these methods are the same: Place the patient in the dorsal or dorsosacral elevated position; sterilize the parts; wash out

FIG. 591.—TREATMENT OF A VESICAL CALCULUS.
Shows the method of removing a small stone through the urethra by means of bimanual palpation. The dotted lines show the progress of the stone through the urethral canal.

the bladder with a warm saturated solution of boric acid; dilate the urethra; and inject three ounces of warm normal salt solution into the bladder.

With Forceps.—The stone may be located by bimanual palpation or with the cystoscope.

In the former case after the position of the stone is recognized the forceps are introduced into the bladder, and, guided by the vaginal finger, the calculus is grasped by the instrument and slowly withdrawn through the urethra (Fig. 590).

In the latter case, after introducing the cystoscope and allowing the salt solution to escape from the bladder, the stone is located by indirect inspection, seized with the forceps, and slowly withdrawn through the instrument.

By Palpation.—The bladder is examined by bimanual palpation and the stone located. By means of the vaginal fingers and by counter-pressure with the fingers of the free hand above the symphysis pubis the calculus is now coaxed into the vesico-urethral opening and into the urethra. The vaginal fingers then push it along the urethral canal and out through the external meatus.

Litholapaxy.—This operation consists in crushing the stone with a lithotrite and washing away the fragments.

It is indicated if the stone is not over one and a half to two inches in diameter and soft enough to crush. On the other hand, the operation is contraindicated if the stone is hard and large or it is encysted; if the bladder does not hold at least four ounces of fluid; if cystitis or a vesical neoplasm is present; and if the patient has not reached the age of puberty.

Operative Technic.—The patient is anesthetized and placed in the dorsal position. The parts are then sterilized, the bladder washed out with a hot saturated solution of boric acid, the urethra dilated, and from six to eight ounces of normal salt solution injected into the bladder.

The lithotrite is now lubricated with sterilized oil and introduced into the bladder. The operator then locates the stone with one or two fingers in the vagina, and while the blades of the lithotrite are opened by an assistant he seizes the calculus and crushes it. After all the large fragments have been broken up a cystoscope is introduced and the debris thoroughly washed out by means of a glass catheter which is attached to an irrigating apparatus containing a warm saturated solution of boric acid.

Vaginal Cystotomy.—This operation consists in removing the stone through an opening made between the bladder and the vagina. It is the operation of selection in the largest proportion of the cases because of the fact that cystitis is almost invariably present and subsequent drainage of the bladder is therefore indicated. The only positive contraindication to vaginal cystotomy is when a stone occurs in a girl before the age of puberty; under these circumstances the genital tract is too small and the tissues too tender to permit of the necessary instrumentation and manipulation without causing serious injury to the parts.

Operative Technic.—The operative technic and the after-treatment are fully described on page 970.

If cystitis is present, the opening should be made permanent by stitching the mucous membrane of the bladder to the mucous membrane of the vagina with interrupted catgut sutures, and later on, when the inflammation has been relieved by appropriate treatment, the fistula is closed in the usual manner.

Suprapubic Cystotomy.—This operation is indicated in girls who have not reached the age of puberty and in women when the stone is too large to remove by the vaginal route.

The technic of the operation is described on page 965.

FOREIGN BODIES.

Classification.—Foreign bodies in the bladder may be classified according to their origin as follows:

Those that enter through the urethral canal.
Those that enter by perforation of the bladder.
Those that enter through the ureters.
Those that originate in the bladder itself.

Those that Enter through the Urethral Canal.—Foreign bodies may accidentally slip into the bladder during an operation or during some internal manipulation upon the organ, and it is also not an uncommon occurrence for hysteric women, as well as masturbators, to pass all sorts of articles through the urethra.

Those that Enter by Perforation of the Bladder.—Foreign substances

may enter the bladder either by direct perforation or by ulceration of its walls. Thus small pieces of bone and fragments of clothing have been driven into the bladder by gunshot wounds and severe pelvic injuries. Pessaries have been known to ulcerate their way through from the vagina into the bladder, and non-absorbable ligatures or sutures used in pelvic operations have eventually penetrated the walls of the organ. A fistulous communication may exist between the bladder and the intestine and fecal matter as well as various intestinal parasites may gain access to the cavity of the organ. Echinococci have been known to penetrate the vesical walls, and in some instances the contents of an ectopic gestation sac, a dermoid cyst, or a pelvic abscess have ruptured into the bladder.

Those that Enter through the Ureters.—Renal calculi, various parasites, such as the echinococci and the filaria sanguinis hominis, pus, and blood may descend from the kidneys and enter the bladder from the ureters.

Those that Originate in the Bladder Itself.—Under this heading are included the various kinds of calculi.

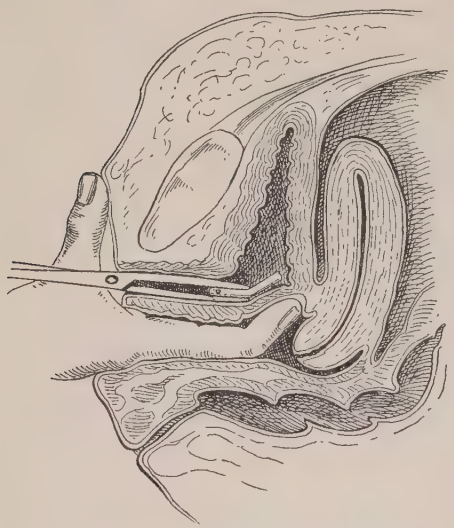


FIG. 592.—TREATMENT OF FOREIGN BODIES IN THE BLADDER.

Shows the method of removing the broken end of a glass catheter through the urethral canal with forceps.

Symptoms.—The symptoms are the same as those of vesical calculus and cystitis. Their character and severity, however, depend largely upon the nature of the foreign body, and hence a smooth object is less irritating than one having sharp uneven edges. Sometimes a foreign substance may remain in the bladder indefinitely without causing any local inconvenience, but, as a rule, symptoms of inflammation rapidly occur, and the patient suffers from frequent urination, pain, tenesmus, and hematuria. A foreign body having a cutting-edge or a sharp point may penetrate the walls of the bladder and cause a fatal peritonitis, or an ulceration may occur and perforation take place either into the peritoneal cavity or the vagina.

Diagnosis.—The symptoms are not pathognomonic, and the diagnosis must therefore be based upon demonstrating the presence of the foreign substance. This is accomplished by (*a*) the sound, (*b*) palpation, and (*c*) the cystoscope. The technic of these methods of examination is fully described under the diagnosis of vesical calculus, and need not therefore be referred to here.

Prognosis.—If the foreign body is removed at once, no harm results; but if it is overlooked and allowed to remain, structural changes occur in the bladder; the kidneys may become involved, and urinary salts are gradually deposited around it and a vesical calculus is formed. The cystitis generally disappears under appropriate treatment after the foreign object has been removed, but if the kidneys have become infected the prognosis is very grave, and the patient eventually dies from the renal complication. A foreign body may perforate the walls of the bladder and cause a fatal peritonitis or escape into the vagina, or, again, it may be expelled spontaneously through the urethral canal.

Treatment.—Foreign bodies in the bladder are removed:

Through the urethra.

By vaginal cystotomy.

By suprapubic cystotomy.

Through the Urethra.—By far the largest number of foreign bodies found in the bladder enter the cavity of the organ through the urethral canal, and hence they can usually be extracted by the same route unless their size has been increased by the deposit of urinary salts, in which case they should be removed through an artificial vesicovaginal opening (*vaginal cystotomy*). Again, a coexisting cystitis is always a contraindication to this method of extracting a foreign object, and, finally, the urethral route should not be selected in girls who have not reached the age of puberty.

The operative technic is described under vesical calculus on page 645.

Vaginal Cystotomy.—This is the operation of selection when a foreign body is associated with marked inflammatory changes in the mucous membrane of the bladder and when it is increased in size by the deposit of urinary salts, and also in the case of a ruptured dermoid cyst or an ectopic gestation sac. The operation should not be performed on girls prior to the age of puberty.

The operative technic is described on page 970.

Suprapubic Cystotomy.—This operation is indicated in women when the foreign body is too large to remove by the vaginal route and in girls who have not reached the age of puberty.

The technic of the operation is described on page 965.

NEOPLASMS.

Vesical neoplasms are either *primary* or *secondary;* the former originate in the bladder itself, while the latter begin in an adjacent organ and extend by contiguity or by metastasis. *Secondary growths* are comparatively frequent, and it is not an uncommon occurrence for carcinoma of the cervix uteri to involve the anterior wall of the vagina and the bladder. *Primary tumors*, on the other hand, are exceedingly rare, and they are from three to five times less frequent in women than in men. They may occur at any period in a woman's life from infancy to extreme old age, although they are most common between forty and sixty and comparatively rare before the age of thirty.

Varieties.—The following growths of the bladder have been described: Fibroma; myoma; lipoma; enchondroma; papilloma; adenoma; carcinoma; and sarcoma.

Fibroma; Myoma.—These tumors are very rare. They develop from the muscular coat of the bladder and are either pedunculated or arise from a broad base. They are usually single, although they may be multiple, and in some cases the tumor may grow toward the peritoneum and form a subserous enlargement upon the external surface of the bladder. These tumors may undergo myxomatous degeneration.

Lipoma.—Small fatty tumors of the bladder have been described; they are exceedingly rare.

Enchondroma.—This variety of tumor has been observed.

Papilloma.—Papillomatous or villous growths are the most common variety of vesical neoplasms. These tumors may be either *benign* or *malignant* in character, and although the macroscopic appearance of the two varieties is, as a rule, very different, it is impossible to make a positive diagnosis of the nature of the growth without the aid of the microscope. A *benign papilloma* may remain indefinitely without causing ulceration; it is usually attached by a narrow

pedicle; it does not return after removal, and the bladder walls do not become infiltrated. A *malignant papilloma*, however, has a broad base; the bladder walls are indurated; ulcerative changes and metastases occur; and the disease returns after removal.

Adenoma.—This variety of vesical tumor has been occasionally observed.

Carcinoma.—Cancer is the most frequent variety of malignant growth met in the bladder.

Sarcoma.—This is a very rare form of vesical tumor. The disease is exceedingly rapid in its course and the growth is either pedunculated or arises from a broad base.

Symptoms.—There are no subjective symptoms present, as a rule, during the early stages in the development of a vesical tumor, but later on in its history the following phenomena manifest themselves:

Hematuria.
Sudden stoppage in the stream of urine.
Cystitis.
Pain.
Fragments of the growth in the urine.
Frequent micturition.
General symptoms.

Hematuria.—Blood in the urine is one of the most constant and characteristic symptoms of a vesical neoplasm. It usually occurs suddenly without any obvious reason and recurs intermittently for an indefinite length of time or disappears altogether in the course of a few days or weeks. In *benign tumors*, as a rule, only a few drops of blood are passed at the end of micturition; but occasionally in the morning the urine may be found to be discolored from the presence of a small quantity of blood. In *malignant growths*, on the other hand, the hemorrhage usually follows some form of active exercise, and is apt to be excessive in amount, producing at times more or less physical exhaustion.

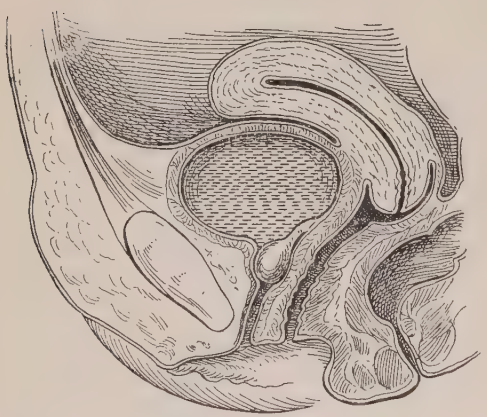


FIG. 593.—SYMPTOMS OF A NEOPLASM OF THE BLADDER.
Shows the sudden stoppage of the stream of urine by a small pedunculated growth blocking the urethral opening of the bladder during micturition.

Hematuria in both benign and malignant tumors is not accompanied by pain or vesical tenesmus.

Sudden Stoppage of the Stream of Urine.—A vesical neoplasm seldom obstructs the flow of urine, but sometimes a fragment of a tumor or a pedunculated growth may be drawn against or into the urethral opening and cause sudden stoppage during micturition, which is generally accompanied with bearing-down efforts upon the part of the patient and by more or less vesical tenesmus.

Cystitis.—Infection of the mucous membrane of the bladder occurs sooner or later and symptoms of cystitis manifest themselves. This complication, as a rule, occurs earlier in malignant than in benign tumors, and is usually more severe in the former variety. Sometimes a benign growth may be present in

the bladder for years without infection occurring, and in these cases the patient may complain of no subjective symptoms whatever. With the onset of cystitis the general health of the patient rapidly becomes impaired and secondary infection of the ureters and kidneys is apt to occur.

Pain.—Local or referred pain, except when it is due to cystitis, is a very inconstant symptom of a vesical neoplasm. In some cases, however, the presence of the tumor itself may cause pain in the region of the bladder, which may be referred to the vestibule, the perineum, and the rectum. Tumors occupying the base of the bladder are apt to be accompanied by pain and vesical irritability as well as an increase in the frequency of urination. Malignant tumors, as a rule, are associated with pain, which appears early and increases in severity as the disease advances and involves the walls of the bladder.

Fragments of the Growth in the Urine.—A very significant symptom which is occasionally present is the discharge of fragments of the tumor with the urine. Under these circumstances a careful microscopic examination should always be made of the expelled tissues, notwithstanding the fact that it is usually impossible to make a positive diagnosis by this means.

Frequent Micturition.—As a rule, the frequency of micturition is not increased except when the mucous membrane becomes infected and cystitis develops. If, however, a benign or malignant growth occupies the base of the bladder, the patient is apt to complain of vesical irritability and frequent urination. Again, the size of the bladder may be diminished by the presence of the growth, and consequently its capacity is lessened and the patient is compelled to urinate frequently. And, finally, the same result may depend upon the infiltration which takes place in the walls of the bladder in malignant tumors.

General Symptoms.—In benign tumors the general health of the patient is seldom affected unless cystitis develops or the kidneys become involved. In the malignant forms of the disease, however, cachexia, emaciation, and exhaustion are constant and well-marked symptoms in the late stages of the affection.

Diagnosis.—The diagnosis is based upon the physical signs, which are determined by means of *bimanual palpation* and *the cystoscope.*

An intermittent hematuria occurring without any apparent cause, and which is not accompanied with pain or symptoms of cystitis, should always be looked upon as being possibly due to the presence of a vesical tumor. The discharge of fragments of the tumor with the urine is an important and characteristic symptom, but we must always bear in mind that broken-down tissue and debris may also be expelled from the bladder in certain forms of cystitis.

Bimanual Palpation.—A digital examination of the walls of the bladder by means of a finger in the vagina and the fingers of the free hand making counter-pressure behind the symphysis pubis is of value only when the tumor is sufficiently hard to be recognized by touch and when the organ is the seat of a general malignant infiltration. In the latter case the thickened, hard, and indurated condition of the walls of the bladder is readily made out and the probable malignant nature of the disease determined (Fig. 594).

The Cystoscope.—The only positive method of determining the condition of the interior of the bladder is by means of the cystoscope, which enables us to recognize the situation and nature of the growth, as well as the state of the vesical mucous membrane.

Prognosis.—A benign tumor may exist for years without causing any local disturbance. A malignant growth, however, ends fatally, in from one to two years. In both varieties cystitis and renal complications are apt to intervene and hasten the course of the disease.

Treatment.—The treatment of vesical tumors may be divided as follows into: (1) the radical and (2) the palliative.

The Radical Treatment.—A tumor of the bladder should be removed by surgical means as soon as it is discovered, provided that the health of the patient, the character and extent of the tumor, and the condition of the kidneys do not contraindicate the employment of radical methods. In old women and in young children the growth is generally malignant in nature, and hence an operation is seldom advisable.

The character of the operation depends entirely upon the nature, situation, and extent of the neoplasm, and it may therefore consist in simply removing a small pedunculated tumor or it may require the partial or complete excision of

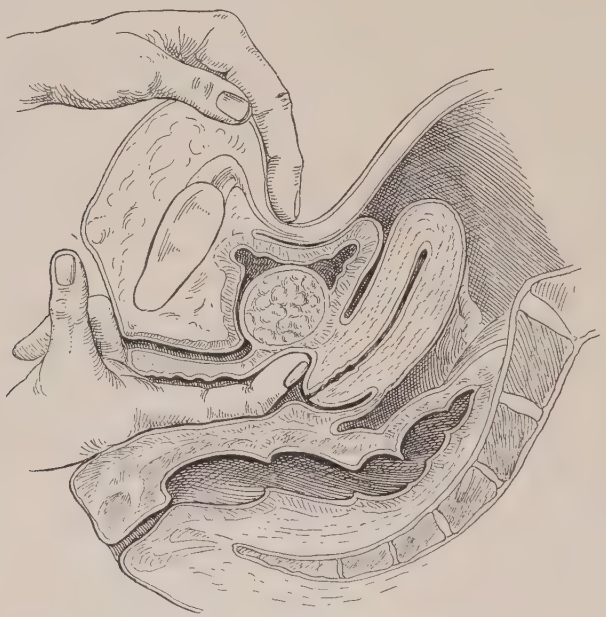


FIG. 594.—DIAGNOSIS OF A NEOPLASM OF THE BLADDER (page 651).
Shows the method of recognizing a vesical tumor by bimanual palpation.

a portion of the wall of the bladder, or, again, in cases of malignant involvement cystectomy may be indicated.

Having decided upon an operation, there are three routes by which the tumor may be removed: (*a*) By the urethra; (*b*) by vaginal cystotomy; and (*c*) by suprapubic cystotomy.

By the Urethra.—The urethral route should only be employed in cases of pedunculated tumors, as it is unsafe to dilate the urethra with an instrument that is larger than one-half an inch in diameter or with a circumference of over one and a half inches, and hence there is not sufficient space in which to properly manipulate the instruments in removing a sessile growth.

Operative Technic.—Having dilated the urethra in the usual manner, the tumor is located by direct inspection through a cystoscope, and a galvanocautery loop or a wire snare is then placed around its pedicle in such a way that a portion of the vesical mucous membrane is included in it. Unless the pedicle is completely removed in this manner the growth may return even when it is

benign in character. The excised neoplasm must be examined by a pathologist, and if it is discovered to be malignant a suprapubic cystotomy should be performed at once and the base of the growth removed along with a portion of the healthy bladder wall.

After-treatment.—The patient should remain in bed one week, and during this period the bladder should be irrigated once a day with a saturated solution of boric acid or normal salt solution. For this purpose a return-flow catheter attached to a fountain syringe or a reservoir with rubber tubing should be employed so as not to distend the bladder and irritate the wound. While the patient remains in bed she should be given a liquid diet (see p. 106) and the urine rendered bland and innocuous by the free use of distilled water or a natural spring-water containing a minimum amount of solid matter. The bowels should be moved daily by an enema or a mild laxative, and if the urine is not passed naturally it should be withdrawn with a catheter every eight hours.

By Vaginal Cystotomy.—This route is only applicable to cases of pedunculated tumors and small sessile growths of a benign nature. The limited space afforded by the vaginal opening prevents the thorough removal of a large tumor or one that is malignant in character, and consequently requiring the complete excision of a portion of the bladder wall.

Operative Technic.—The vesicovaginal opening is made in the usual manner (see p. 970), and, guided by the index-finger passed through the incision into the bladder, the tumor is seized with volsella forceps and pulled out into the vagina.

If the growth is pedunculated, the vesical mucosa is seized with bullet forceps at opposite points a short distance from the base of the pedicle, which is then severed with scissors so as to include a portion of the surrounding mucous membrane. The raw edges are then united with interrupted catgut sutures and the artificial opening closed in the usual manner.

If the growth has a broad flat base, the vesical mucosa is caught by bullet forceps at opposite points a short distance from the base of the tumor, so as to control the seat of operation while the neoplasm is being removed and the sutures introduced. Having secured the bladder and the tumor in this way, the growth is then dissected out with scissors and a knife and the raw edges united with interrupted catgut sutures. The artificial opening is finally closed in the usual manner.

After-treatment.—The patient should remain in bed ten days and the stitches in the vaginal wall are removed on the eighth day. The bladder should be catheterized every four hours during the first three days to prevent tension upon the vesicovaginal wound, and then every eight hours unless the urine is voided spontaneously. While the patient remains in bed a vaginal douche of corrosive sublimate, 1 to 2000, should be given daily, followed by normal salt solution or plain sterile water. The irrigation of the bladder, the diet, the drink, and the care of the bowels are the same as when the tumor is removed by the urethral route.

By Suprapubic Cystotomy.—This is by far the best and the most satisfactory route through which to remove the majority of vesical tumors, as it thoroughly exposes the seat of operation and facilitates the necessary manipulations during the extirpation of a large tumor or the excision of a portion or the whole of the bladder.

Operative Technic.—The technic and after-treatment of suprapubic cystotomy are fully discussed on page 965, and I shall therefore only refer to certain points in the operation which are important to bear in mind when it is performed for the removal of a tumor of the bladder.

1. After the bladder has been opened the edges of the incision are temporarily stitched to the abdominal opening to steady the bladder and to facilitate the removal of the tumor.

2. The cavity of the bladder is then carefully explored by sight and touch to determine the situation and character of the growth.

3. Hemorrhage may be controlled by catgut sutures, the thermocautery, and tamponing the bladder and the vagina. If the tampon is left in the bladder after the operation, it is removed through the abdominal opening at the end of twenty-four hours and another one inserted if the bleeding continues; the vaginal tampon is also removed at the same time and reintroduced if necessary.

4. The removal of the tumor is greatly facilitated by having an assistant place two fingers in the vagina to push forward or steady the bladder as directed by the operator.

The nature of the operation depends upon the character and extent of the growth.

A *pedunculated tumor* is removed by dividing its pedicle close to the bladder wall with scissors and suturing the edges of the wound with interrupted catgut sutures. The incision into the bladder is then united with interrupted catgut sutures, which should not include the vesical mucous membrane, and the abdominal incision closed in the usual manner. The after-treatment is the same as when the growth is removed through the urethral canal.

A *benign tumor having a broad base and involving only the mucous membrane of the bladder* is removed by incising the mucosa around the limits of the growth and dissecting the entire mass from the muscular structures below. The raw surface is then covered by uniting the edges of the wound with interrupted catgut sutures. Sometimes, however, the dissection is so extensive that the edges of the wound cannot be completely approximated, and it is necessary to leave the rest of the denuded surface to heal by the formation of new mucous membrane. "Almost the whole of the vesical mucosa may be taken away and yet it will regenerate, but whenever little islets or strips of sound mucosa can be left this should be done, as the new mucous membrane starts to grow from these centers" (Kelly). The opening into the bladder and the abdominal incision are finally closed in the usual manner. The after-treatment is the same as when a growth is removed by the urethral canal, except in cases in which there has been an extensive resection of the mucosa and the edges of the wound cannot be completely united. Under these conditions a permanent catheter must be kept in the bladder one week or more and the patient should remain in bed three weeks. The bladder should be irrigated daily with boric acid or normal salt solution as in uncomplicated cases.

A *benign tumor involving the muscular coat or a malignant growth* should be removed by completely resecting the portion of the bladder wall occupied by the neoplasm. In the case of a malignant tumor a sufficient amount of healthy tissue should be removed to insure the complete extirpation of the growth. It is often astonishing what a large portion of the bladder may be resected without materially interfering with the function of the organ, especially if, later on, hydrostatic pressure is employed systematically for several weeks to increase its holding capacity.

If the neoplasm involves the free or unattached portion of the bladder, the operation is comparatively simple. The peritoneal cavity is opened by enlarging the abdominal incision and the tumor and the bladder wall are then resected. This results in an opening which is easily closed with interrupted catgut sutures that are passed from without inward, including all the structures except the mucous membrane, and tied on the outside or the peritoneal surface of the blad-

der. The suprapubic opening in the bladder and the abdominal incision are finally closed in the usual manner. The *after-treatment* is the same as when a growth is removed through the urethral canal, except that a permanent catheter should be kept in the bladder about one week and the patient must remain in bed two weeks. The bladder should be irrigated daily with boric acid or normal salt solution.

When the tumor occupies the base or an attached portion of the bladder, the difficulties and dangers of the operation are greatly increased. This is especially true when the new-growth involves the structures in the neighborhood of the ureters, and the greatest skill and care must be employed to prevent injuring them. In these cases the ureters should first be dissected out and then transplanted higher up in the posterior wall of the bladder or even in the fundus. The bladder wall and the tumor are then dissected from the vagina and the adjacent structures with a knife, a blunt dissector, and the fingers, being extremely careful and cautious not to wound the surrounding parts. The seat of operation should be kept constantly dry by ligating all bleeding vessels with catgut sutures. The wound is then closed by uniting its edges with interrupted catgut sutures, which are passed from within outward, including *all* the coats of the bladder, and tied within the cavity of the organ. Sometimes it is impossible, on account of the size of the wound, to approximate its edges completely, and it is necessary to leave a raw surface which eventually heals by granulation. If the edges of the wound can be accurately united, the suprapubic opening in the bladder and the abdominal incision should be closed at once in the usual manner, otherwise they must be left open and drainage established with gauze above and a permanent catheter below in the urethra. The *after-treatment* is the same when the suprapubic opening is closed as when a tumor is removed through the urethral canal, except that a permanent catheter must be kept in the bladder seven days and the patient should remain in bed three weeks. The usual boric acid or normal salt solution should be used daily as a douche. If, however, a gauze drain is used above the pubes, it should be removed every twenty-four hours and another one inserted into the bladder; this dressing should be reapplied daily until the wound becomes contracted, when it should be discontinued and the opening allowed to heal by granulation. The permanent catheter should remain in position two weeks except when it is temporarily removed each day to irrigate the bladder. The patient should not get out of bed under three weeks.

In cases of extensive malignant disease it may exceptionally be deemed proper to remove the entire bladder (*cystectomy*). This has been successfully accomplished by Pawlik, who first dissected out the ureters and turned them into the vagina, and three weeks later completely extirpated the bladder by a combined suprapubic and vaginal incision, preserving the urethral canal, which he sutured into the vagina. He then closed the vulvovaginal orifice completely, converting the vagina into a reservoir for the urine, which was voided through the transplanted urethra.

Special After-treatment.—Frequently after the successful removal of a vesical tumor the patient is not restored to a normal condition because of the presence of chronic cystitis or contraction of the walls of the bladder which lessens the holding capacity of the organ. Under these conditions the patient is apparently but slightly benefited by the extirpation of the tumor, and consequently a careful examination should always be made and the existing lesions definitely determined in order to institute the proper treatment.

Cystitis.—As we have already seen, inflammation of the bladder is a common complication of vesical tumors, and while a benign growth may exist indefinitely without this affection occurring, yet it is only a question of time before the vesical

mucosa becomes infected in all cases. The disease is usually subacute or chronic from the start and the lesions are generally permanent in character, and consequently the removal of the tumor which is the predisposing cause of the infection does not always cure the cystitis. Therefore when a tumor of the bladder has been removed and the symptoms of cystitis persist after the patient gets out of bed, a careful cystoscopic examination should be made to determine the nature of the lesions and the character of treatment to be instituted.

Contraction of the Lumen of the Bladder.—It is not uncommon to meet cases in which painless frequent urination persists after the removal of a vesical tumor and in which a thorough cystoscopic examination fails to reveal any abnormal condition of the mucous membrane of the bladder. Under these circumstances the capacity of the bladder should be tested, and if it is found to be decreased, hydrostatic pressure should be employed to restore the organ to its normal size.

In these cases the lumen of the bladder is lessened by the hypertrophy and contraction of its walls which accompany the presence of a vesical tumor or which result from a coexisting cystitis. In other instances it may be due to the cicatricial contractions which take place after the removal of a vesical growth, especially when the edges of the wound are not accurately united, and, finally, it may result from resection of a portion of the bladder wall.

The Palliative Treatment.—In non-operative cases of vesical tumors we are frequently called upon to treat the local symptoms, which are not only distressing and annoying to the patient, but which also, on account of their severity, endanger life or hasten the fatal ending. In these cases the principal symptoms to combat are frequent urination, vesical tenesmus, pain, and hemorrhage. In some instances as the tumor increases in size and encroaches upon the vesicourethral opening retention of urine occurs, which may be partial or complete and often the cause of great distress.

The formation of an artificial vesicovaginal fistula (see *vaginal cystotomy*, p. 970) is indicated in non-operable cases, as it puts the bladder at rest, and affords constant drainage and hence relieves the symptoms which are dependent upon the cystitis and the presence of the tumor. Good results are also obtained by irrigating the bladder daily through the urethra and allowing the fluid to escape into the vagina. For this purpose nothing is better than the antiseptic and soothing solutions recommended in the treatment of cystitis (see p. 635), which may be employed by means of the irrigating apparatus already described (Fig. 574).

The control of hemorrhage from the seat of disease is sometimes not only difficult but even impossible, and in malignant cases the constant loss of blood quickly exsanguinates the patient and hastens her death.

In some instances the bleeding may be controlled by irrigating the bladder with hot sterile water or normal salt solution, by injections of alum or tannic acid, and by applying an ice-bag over the hypogastric region. Good results are sometimes obtained by packing the vagina with gauze and allowing it to remain for six or eight hours, and, finally, the use of a solution of adrenalin chlorid (1 to 1000) directly applied to the mucous membrane through a cystoscope will often check the bleeding.

The pain which usually accompanies non-operable tumors of the bladder should be controlled by the free use of opium, which may be administered hypodermically or in the form of a suppository combined with belladonna.

CHAPTER XXXI.

THE URETERS.

METHODS OF EXAMINATION.

The ureters can be examined by the following methods:

Vaginal palpation.
Rectal palpation.
Abdominal palpation.
Inspection.
Catheterization; Sounding.
Segregation of the urine.
Microscopic and Bacteriologic examinations.
The *x*-rays.

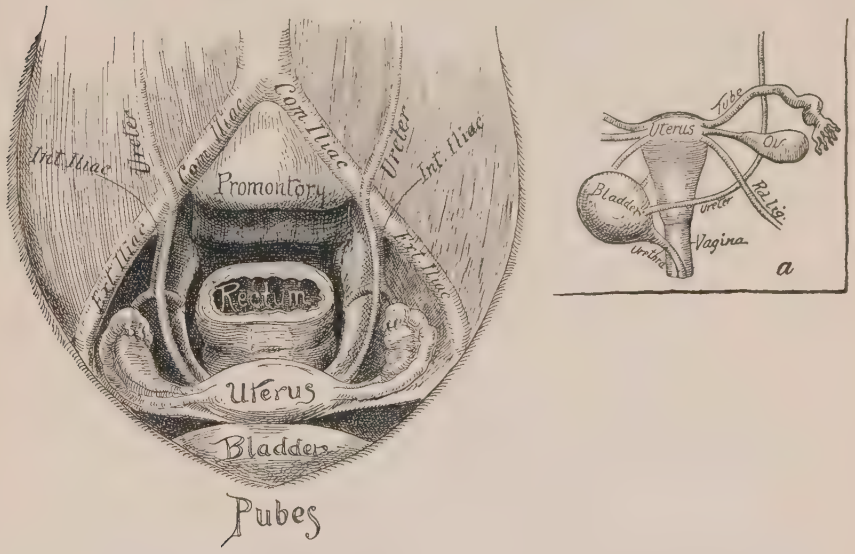


FIG. 595.—RELATION OF THE URETERS TO THE PELVIC ORGANS AND BLOOD-VESSELS.
Illustration *a* shows the ureters passing through the base of the broad ligaments to the bladder, which is drawn toward the right.

VAGINAL PALPATION.

Limitations.—The ureters can be palpated through the vagina from the base of the broad ligaments to their entrance into the bladder (Fig. 596).

Information.—By vaginal palpation we are able to recognize the size, shape, mobility, and sensitiveness of the ureters. In cases of ureteritis the canal is enlarged and tender to the touch, and in some instances fixed in its position by periureteral inflammation. In tubercular ureteritis the outline of the canal is irregular and uneven, owing to the presence of nodules in its walls.

Preparation of the Patient.—The rectum should be thoroughly emptied with an enema and the urine should be voided naturally, as the bladder is more thoroughly evacuated in this way than by the use of a catheter.

Position of the Patient.—The patient should be placed in the dorsal position.

Technic.—The left index-finger is used to palpate the right ureter and the right finger the left ureter.

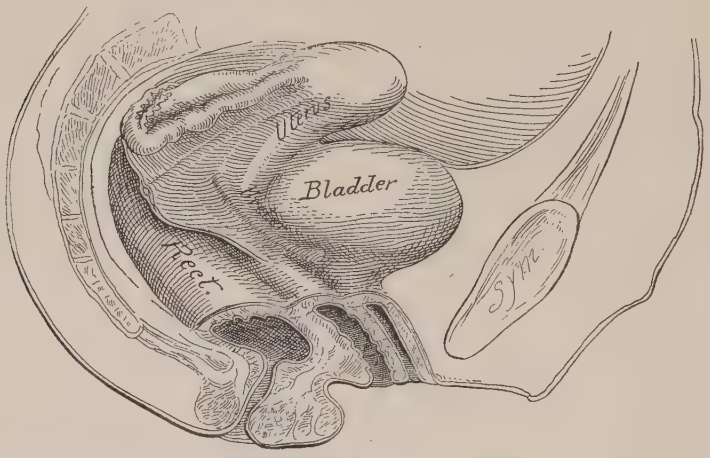


FIG. 596.—EXAMINATION OF THE URETERS BY VAGINAL PALPATION.
Shows the relation of the right ureter to the vagina.

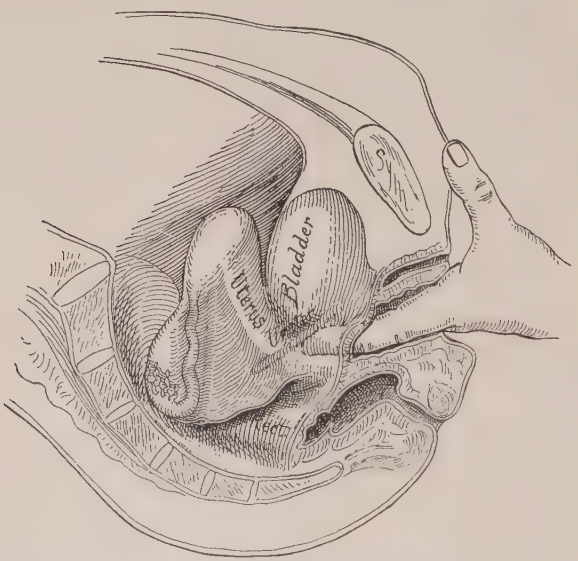


FIG. 597.—EXAMINATION OF THE URETERS BY VAGINAL PALPATION.
Showing the right ureter being palpated through the vagina by the left index-finger.

The index-finger is introduced into the anterolateral vault of the vagina, which is made tense by an upward and lateral pressure with the tip of the finger. The structures are now firmly but gently palpated in various directions within a limited space until the ureter is felt and recognized as a flat, cord-like body about one-eighth of an inch in diameter which is readily displaced in its bed of loose

cellular tissue. By moving the finger either toward the broad ligament or toward the bladder all that portion of the ureter which can be reached through the vagina is readily palpated and examined.

Variations in Technic.—The ureter may also be palpated by vagino-abdominal touch. The index-finger is introduced into the anterolateral vault

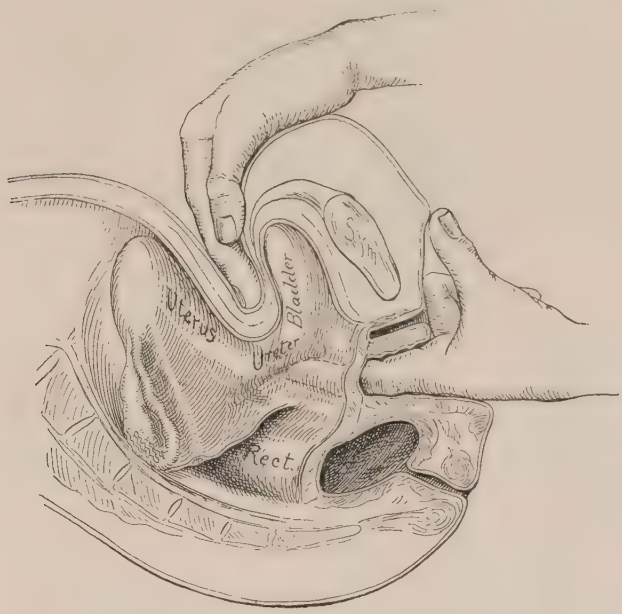


FIG. 598.—EXAMINATION OF THE URETERS BY VAGINO-ABDOMINAL TOUCH.
Showing the right ureter being palpated between the internal finger and the fingers of the external hand.

of the vagina and counter-pressure made downward through the abdominal wall above the symphysis pubis. The ureter can thus be easily palpated and recognized by the internal finger.

Toward the end of gestation the ureter can be palpated by pressing the vaginal vault against the fetal head after it has sunk into the pelvic cavity.

RECTAL PALPATION.

Limitations.—The ureter can be palpated through the rectum from the base of the broad ligament and along the posterior wall of the pelvis to the superior strait (Fig. 599).

Information.—The same as in vaginal palpation.

Preparation.—The same as for vaginal palpation.

Position of the Patient.—The same as for vaginal palpation.

Technic.—The left index-finger is used to palpate the left ureter and the right finger the right ureter.

The finger is introduced into the rectum and passed upward and backward to where the common iliac artery divides. The internal iliac artery is then located and traced downward by the tip of the finger. Palpating somewhat behind and at the side of the artery, the ureter can be followed along its course until it passes under the base of the broad ligament (Figs. 599 and 600).

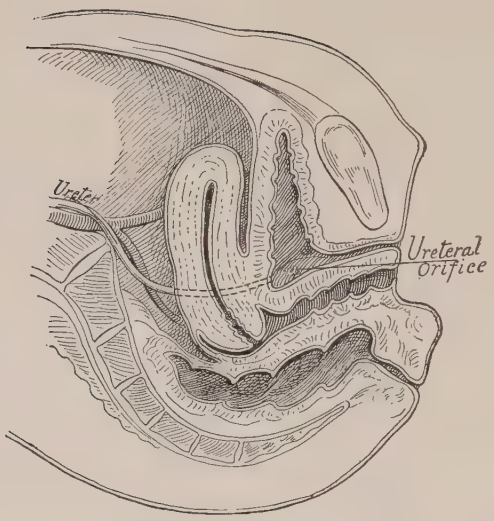


FIG. 599.—EXAMINATION OF THE URETERS BY RECTAL PALPATION (page 659).
Shows the relation of the left ureter with the pelvic cavity and brim and the common and internal iliac arteries.

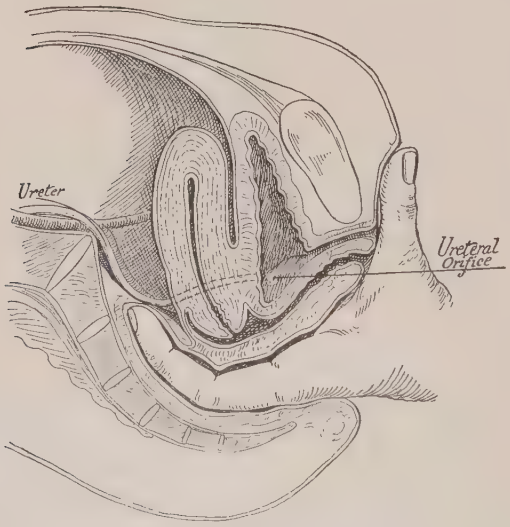


FIG. 600.—EXAMINATION OF THE URETERS BY RECTAL PALPATION (page 659).
Showing the left ureter being palpated through the rectum by the left index-finger.

ABDOMINAL PALPATION.

Limitations.—The normal ureter can seldom be felt by abdominal palpation. When it is inflamed, however, pain is elicited at the brim of the pelvis about one to one and a quarter inches on either side of the promontory of the sacrum and over the upper or renal portion by deep palpation. An enlarged ureter can often be felt as it crosses the brim of the pelvis, and in patients who have exceedingly thin belly walls the normal organ may also be occasionally palpated at the same point.

Information.—Inflammation and enlargement of the ureteral canal can often be demonstrated by deep abdominal palpation.

Preparation of the Patient.—The bladder should be emptied spontaneously and the intestines thoroughly evacuated so that the colon will be

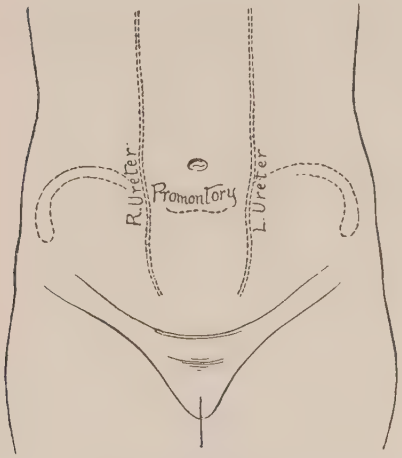


FIG. 601.—EXAMINATION OF THE URETERS BY ABDOMINAL PALPATION.
Shows the positions of the ureters as they pass over the brim of the pelvis.

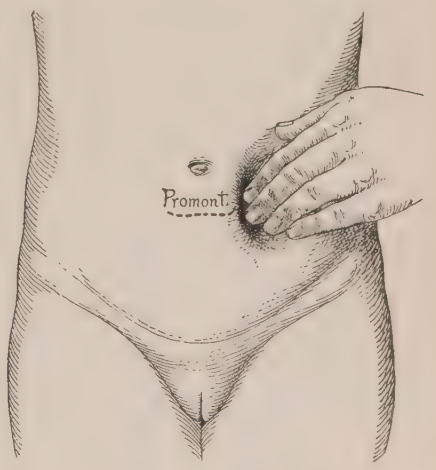


FIG. 602.—EXAMINATION OF THE URETERS BY ABDOMINAL PALPATION.
Shows the position of the promontory of the sacrum and the method of palpating the left ureter.

collapsed at the time of the examination. This is best accomplished by giving the patient a bottle of citrate of magnesia and following it with a large rectal enema of soapsuds and warm water.

Position of the Patient.—The patient is placed in the horizontal recumbent posture with the lower limbs flexed and the shoulders elevated upon a pillow.

Technic.—The examiner first locates the promontory of the sacrum by pressure downward and backward through the abdominal wall. He then moves his finger from one to one and a quarter inches on either side of the promontory, where the ureter can be palpated as it passes over the brim of the pelvis. If the upper portion of the ureter is inflamed, the course of the canal can be followed by the pain which is elicited on pressure.

INSPECTION.

Limitations.—The vesical orifice is the only portion of the ureter that can be seen by inspection through the cystoscope.

Information.—This method of examination often gives very valuable

points in the diagnosis of a case. Thus, the appearance of the opening may indicate ureteral inflammation or eversion of the mucosa; a calculus or a polyp may be seen partly projecting into the bladder; a complete obstruction of the ureter may be suspected when urine is seen escaping from only one of the orifices; and, finally, if blood or pus is observed coming from one or both of the ureteral openings, we have decided evidence of a tubercular or purulent inflammation being present. If clear urine is seen spurting from both of the orifices, we may exclude pyoureter and pyonephrosis.

Preparation of the Patient.—The colon must be thoroughly evacuated by giving the patient a bottle of citrate of magnesia, followed by a large rectal enema of soapsuds and water. No food should be taken for several hours prior to the examination, and the urine must be voided naturally just before the patient is examined.

When the patient is placed on the examining table, the external urethral opening, the vestibule, and the entire vulva must be thoroughly sterilized to prevent infection being carried by the cystoscope into the bladder. This is accomplished

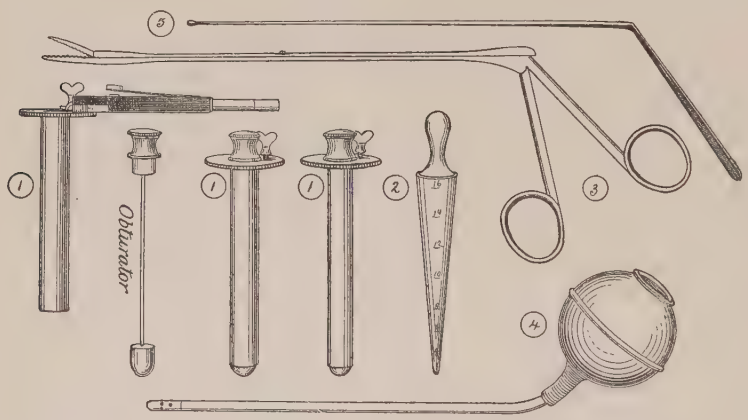


Fig. 603.—Instruments Used for Examining the Ureters by Inspection.

by scrubbing the parts with a gauze sponge saturated with tincture of green soap and warm water and washing them with a solution of corrosive sublimate (1 to 1000), which in turn is removed by douching with sterile water.

Position of the Patient.—The patient is always examined in the dorsosacral elevated position. The hips must be elevated from twelve to fourteen inches above the surface of the table so as to raise the pelvis and allow the bladder to balloon out when the cystoscope is introduced.

I have never found any necessity for placing a patient in the knee-chest position to inspect or sound the ureters, and even in very fat women there is always enough dilatation of the base of the bladder to readily locate the ureteral orifices.

Instruments.—(1) The Ashton-Gans cystoscopes (three sizes—Nos. 24, 30, and 36, French scale); (2) Kelly's cone-shaped urethral dilator; (3) long, delicate alligator-jaw forceps; (4) Ashton's modified Snell's residual urine evacuator; (5) Kelly's ureteral searcher.

Description of the Instruments.—The instruments are described under cystoscopy on page 622.

Sterilization of the Instruments.—The method of sterilizing the instruments is given under cystoscopy on page 623.

Absorbent Cotton and Boric Acid Solution.—Small pledgets of absorbent cotton and a saturated solution of boric acid must be on hand to clean the trigone of the bladder if it is found necessary to use the searcher in locating the ureteral orifices.

Liquid White Vaselin.—This material is used as a lubricant for the instruments and is sterilized in the same manner as liquid soap (see p. 814).

Rubber Gloves.—The examiner should wear rubber gloves to guard against contaminating the instruments and carrying infection into the bladder.

Anesthesia.—A general anesthetic is required, as a rule, for the first examination; and if a subsequent inspection is necessary, it may be accomplished under the influence of a 10 per cent. solution of cocain applied on a pledget of cotton to the urethra.

Technic.—After dilating the external meatus of the urethra, introducing the cystoscope, and removing the residual urine in the manner already described under the technic of cystoscopy on page 623 (Figs. 534, 535, 581), the examiner then locates the ureteral openings for inspection as follows:

Gradually withdraw the cystoscope from the bladder until the internal opening of the urethra begins to close over it, then advance the instrument about one-third of an inch and raise the handle to expose the vesical trigone. Now turn the cystoscope either to the right or left about thirty degrees and one of the ureteral orifices will appear in the field of vision.

The vesical opening of the ureter varies in appearance even in health, and hence it may be occasionally difficult to locate. Usually, however, its position is marked by a small pinkish prominence, or it may look like a delicate slit or a pit or dimple in the mucous membrane at the extremity of the interureteric ligament, from which a little stream of urine is seen to spurt at regular intervals. Sometimes, however, no distinctive mark is apparent, and the orifice can only be located by observing the position on the surface of the mucous membrane from which small jets of urine are ejected or by exploring the base of the trigone with the searcher.

Unless the examiner sees the urine actually spurting from the orifices of the ureters, he cannot be certain *by inspection alone* that he has located them. This fact is important to bear in mind; otherwise, having incorrectly located what is supposed to be a ureteral opening, and after watching it for a few minutes without seeing any urine escape, the examiner may conclude that a complete obstruction exists somewhere in the canal; whereas if the supposed opening is probed with a searcher before coming to such a conclusion, a mistake of this character would be avoided.

CATHETERIZATION AND SOUNDING.

Limitations.—The entire length of the ureteral canal and the pelvis of the kidney can be explored by these methods.

Information.—By the use of catheters and sounds we are able to recognize the presence of strictures and calculi; the existence of a hydroureter and a hydronephrosis or a pyoureter and a pyonephrosis; to collect the urine separately from each kidney uncontaminated by the bladder; and, finally, to diagnosticate a torsion in the ureteral canal by the peculiar rotary motion which the catheter takes as it is withdrawn from the ureter.

Preparation of the Patient.—Same as for inspection (see p. 662).

Position of the Patient.—Same as in inspection (see p. 662).

Instruments.—(1) The Ashton-Gans cystoscopes (three sizes—Nos. 24,

30, and 36, French scale); (2) Kelly's cone-shaped urethral dilator; (3) alligator-jaw forceps; (4) Ashton's modified Snell's residual urine evacuator; (5) Kelly's

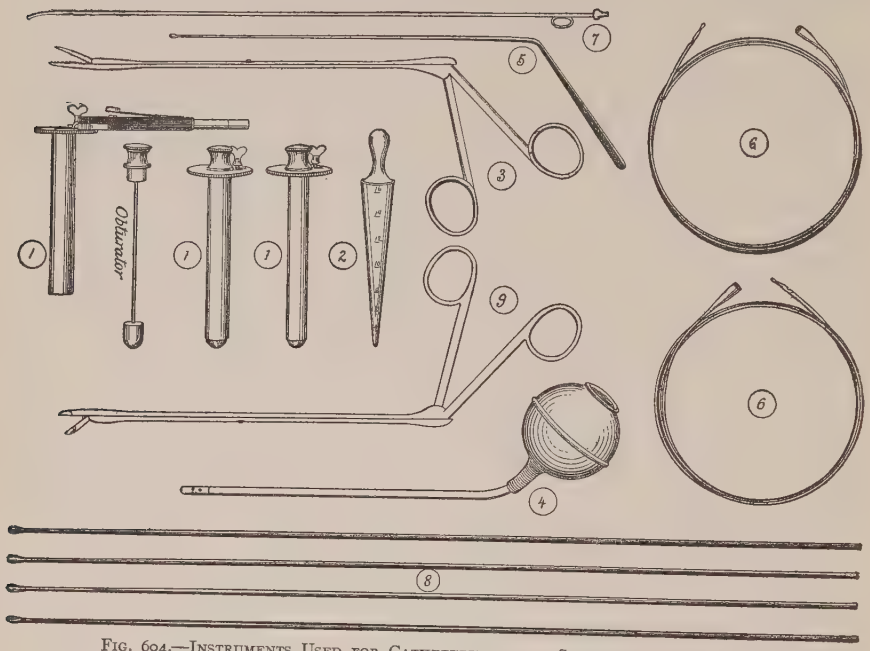


Fig. 604.—Instruments Used for Catheterizing and Sounding the Ureters.

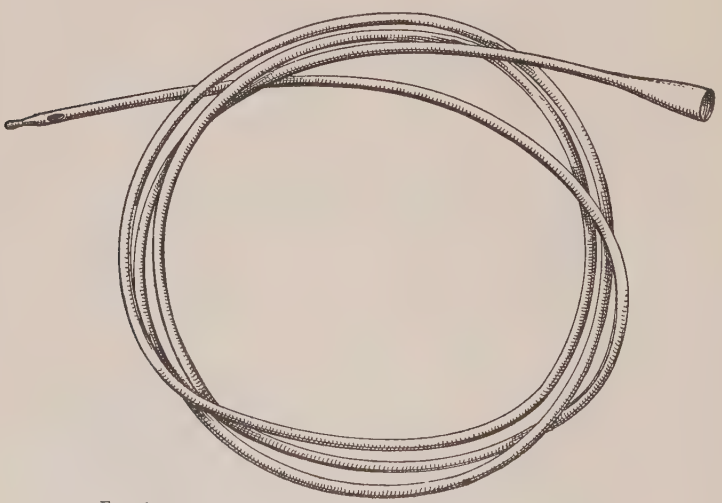


Fig. 605.—Flexible Silk Ureteral Catheter, Actual Size.

ureteral searcher; (6) flexible silk catheters; (7) Kelly's metallic catheter; (8) Kelly's flexible hard-rubber sounds; (9) Ashton's conducting forceps for flexible catheters.

Flexible Silk Catheters.—These instruments are 20 inches long and 2 millimeters in diameter, and, being very flexible, readily pass through the ureteral canal. The French catheters are superior to those made in other countries, as they are more delicately shaped and stronger in construction.

With flexible catheters we can collect the urine separately from each ureter; diagnose the presence of calculi and strictures; and ascertain whether the ureteral canal or the pelvis of the kidney is distended with pus or urine.

Metal Catheter.—This instrument is 12 inches long and 2.5 millimeters in

Fig. 606.—Kelly's Metallic Ureteral Catheter.

diameter, and is used to pass a stricture or a twist in the vesical end of the ureter which obstructs the introduction of a flexible catheter.

Flexible Hard-rubber Sounds.—The sounds are made of hard-rubber and vary in size. They are 20 inches long and rounded off at their points into an olive-shaped cone (from 2 to 3 millimeters in diameter) which is thicker than the handle or shaft of the instrument.

Conducting Forceps.—This instrument is made upon the same principle as the alligator-jaw forceps, except that its blade is grooved and opens at right angles to the shaft. It is used to seize the vesical end of the catheter and conduct

Fig. 607.—Kelly's Hard-rubber Flexible Ureteral Sound. Actual Size of Distal End.

it into the ureteral canal, doing away with the necessity for a stylet to stiffen the instrument.

Sterilization of the Instruments.—The metallic catheter, the flexible rubber sounds, and the conducting forceps are sterilized by boiling in a soda solution for five minutes before using. The method of sterilizing the instruments which are also used for inspecting the ureteral orifices is given under Cystoscopy on page 623.

The silk catheters are made aseptic as follows: Before using, each catheter is rinsed and flushed out with a cold solution of corrosive sublimate (1 to 1000),

Fig. 608.—Ashton's Conducting Forceps. Actual Size of Distal End.

followed by sterile water, and laid on a sterile towel until required. After use the catheters are again rinsed and flushed with the corrosive sublimate solution and sterile water and laid out straight on a sterile towel to dry. They are then wrapped separately in a towel and placed in the storage case until needed. In septic cases after each catheter is rinsed and flushed it is sterilized by high-pressure steam or by boiling in plain water for two minutes; it is then laid on a towel to dry and put away in the storage case. Before sterilizing the catheters they must be wrapped separately in gauze in order to keep the surfaces apart and prevent them from becoming glued together.

A flexible silk catheter should not be sterilized by steam or boiling water

immediately before use, as it loses its stiffness and is more difficult to introduce into the ureter. For the purpose of flushing or cleaning a catheter nothing is better than an ordinary hypodermic syringe. After filling the syringe the needle

FIG. 609.—TIP OF A HARD-RUBBER FLEXIBLE SOUND COATED WITH WAX.
Actual size of distal end of the sound.

is passed into the proximal end of the catheter and the solution forced through its lumen.

Rubber Gloves; Absorbent Cotton; Boric Acid Solution; Liquid White Vaselin.—The various purposes for which these articles are used are given under Inspection of the Ureters on page 663.

Anesthesia.—A general anesthetic is usually required.

Wax-tipped Sounds.—In cases in which a calculus is suspected Kelly

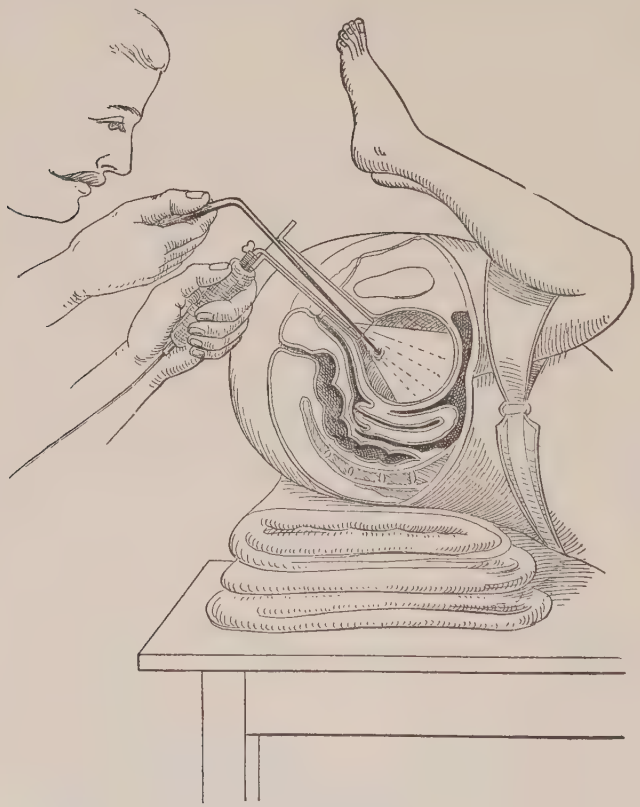


FIG. 610.—CATHETERIZATION AND SOUNDING OF THE URETERS.
Shows the searcher being introduced into the orifice of the right ureter.

coats the tip of a hard-rubber flexible sound with melted wax and allows it to harden. When the tip of the instrument comes in contact with the stone, its rough edges scratch the surface of the wax, and these marks can be seen by the naked eye or a lens of low power after the sound is withdrawn.

Technic.—After dilating the external meatus of the urethra, introducing the cystoscope, and removing the residual urine as described under the technic of cystoscopy on page 623 (Figs. 534, 535, and 581), the examiner locates the ureteral orifices by inspection and makes sure of their position, if there be any uncertainty, by passing the searcher into the canals for a short distance. Before introducing the searcher, however, the opening of the ureter and the surrounding mucosa must be thoroughly cleansed with boric acid solution.

The end of the catheter or sound is now dipped into liquid white vaselin, passed through the cystoscope into the ureter, and introduced very slowly up the canal.

When a flexible silk catheter is used, care must be taken to prevent it be-

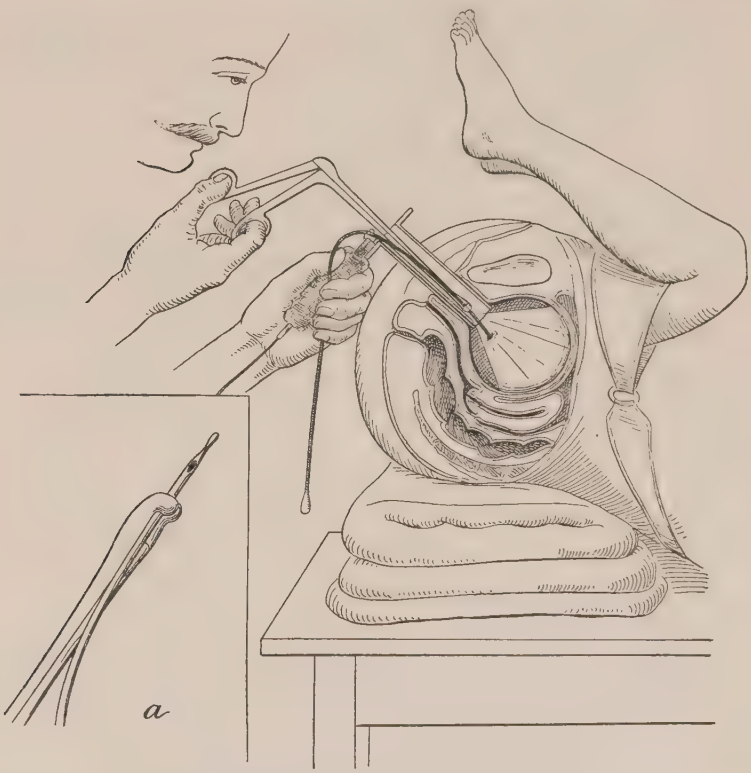


FIG. 611.—CATHETERIZING AND SOUNDING THE URETERS.

Shows a flexible silk catheter being introduced into the right ureter by means of Ashton's conducting forceps. Note the way in which the examiner holds the free end of the catheter in his left hand. Illustration *a* (actual size) shows the distal end of the forceps holding the catheter.

coming infected while being introduced, and to guard against this accident the instrument should be held by the operator close to the cystoscope (Fig. 611).

The catheter is grasped by the conducting forceps about an inch from its vesical end and passed through the cystoscope into the ureteral canal. The blades of the forceps are then loosened and slipped along the catheter for about one inch, when they are again tightened and the catheter pushed further up the ureteral canal. This procedure is repeated until the catheter reaches the pelvis of the kidney or meets an obstruction. The introduction of a flexible catheter

is greatly facilitated by the use of the conducting forceps, as the operator is able to direct the instrument with precision and prevent it from doubling upon itself.

Method of Obtaining Separate Urine.—To obtain separate urine from the ureters a flexible catheter is passed into both of the ureteral canals and the urine allowed to escape into test-tubes or sterile bottles. After the catheters have been introduced the cystoscope is withdrawn and the patient placed in the dorsosacral position by removing the pillows from under the buttocks.

It is important in obtaining separate urine to mark the catheters so as to know into which ureter each of them is passed. This is readily accomplished by

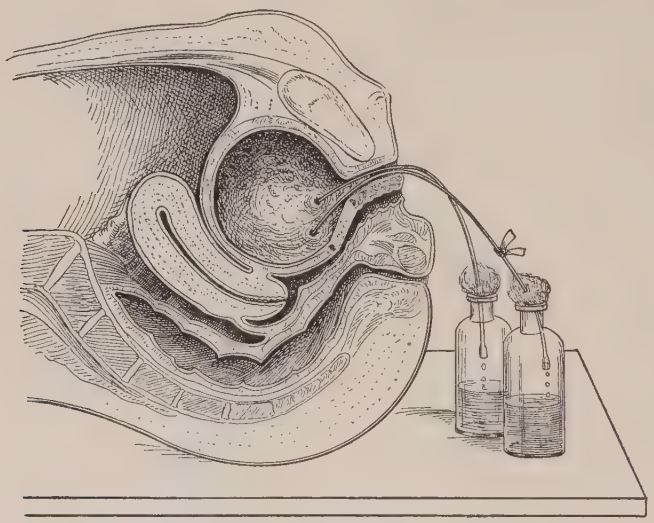


FIG. 612.—METHOD OF OBTAINING SEPARATE URINE.
Note that the patient is in the dorsosacral position (not elevated) and that a string is tied around the catheter introduced into the right ureter.

tying a piece of string around one of the catheters and noting into which ureter it is introduced before withdrawing the cystoscope.

Method of Locating the Situation of an Obstruction.—In cases of ureteral obstruction it is often important to know how far the catheter or sound has passed into the ureter in order to locate the situation of the lesion and determine upon the proper plan of treatment. This is readily done by grasping the catheter or sound close to the ureteral orifice with the conducting forceps and measuring the distance to its tip after the instrument has been withdrawn from the ureter.

SEGREGATION OF THE URINE.

Limitations.—The segregator can collect the urine separately from the kidneys, but it cannot deliver the urine free from bladder contamination.

Information.—Owing to the limitations in the use of the segregator, it cannot be employed to distinguish between cystitis and ureteral or kidney lesions because the urine is contaminated by the bladder, and consequently it is impossible to know the source of any abnormal constituents that may be present in the urinary excretions. In these cases, therefore, we must resort to catheterization and obtain the urine directly from the ureters.

On the other hand, however, segregation has distinct advantages over catheterization, and positive information of a valuable character can often be determined by obtaining separate urines with the segregator. The advantages of the instrument are that there is no danger of infecting the ureters with septic or tubercular material from the bladder, and it is introduced with but little, if any, discomfort or pain to the patient.

With the segregator we are able to determine the presence of two kidneys and their relative functional activity in cases in which a nephrectomy is contemplated; in the case of a unilateral renal lesion we can locate the diseased kidney by analyzing the separate urines; the presence of a complete obstruction in one of the ureters can also be demonstrated, although its cause can only be elicited with the catheter or the sound; and, finally, segregation should always be employed when the question arises of having accidentally clamped or ligated a ureter during a pelvic operation.

Preparation of the Patient.—The rectum should be thoroughly emptied with an enema and the urine voided naturally immediately before the

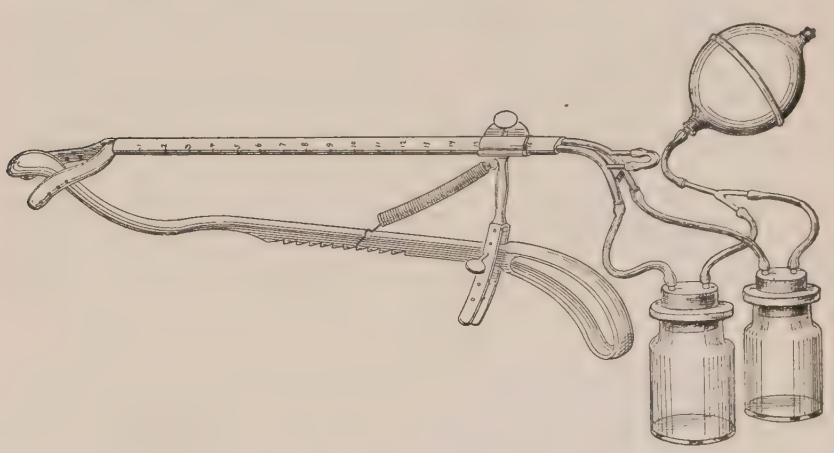


Fig. 613.—Harris's Segregator for Segregating the Urine.

examination. When the patient is placed on the table, the meatus and the vulva should be thoroughly sterilized (see Inspection) and the bladder irrigated with a warm saturated solution of boric acid, allowing enough of the fluid to remain to slightly distend the cavity of the organ.

Position of the Patient.—The dorsal position is employed.

Instruments.—The only instrument required is Harris's urine segregator, which forms a watershed by raising the base of the bladder between the orifices of the ureters.

Antisepsis.—Sterilization of the Instrument.—The segregator, the glass vials, and the exhaust bulb are boiled for five minutes in plain water and placed in a tray until ready for use.

Rubber Gloves.—The examiner should wear rubber gloves to guard against infecting the segregator and thus carrying septic material into the bladder.

Anesthesia.—An anesthetic is seldom required except in nervous or very sensitive women.

Technic.—The segregator without its attachments and its flat distal ends in contact so as to form a single continuous shaft is introduced into the bladder.

Each catheter is then rotated on its long axis by directing each proximal end outward and downward. The vesical ends of the segregator are thus separated and lie close to the ureteral orifices.

The vaginal lever is now introduced into the vagina and connected with the

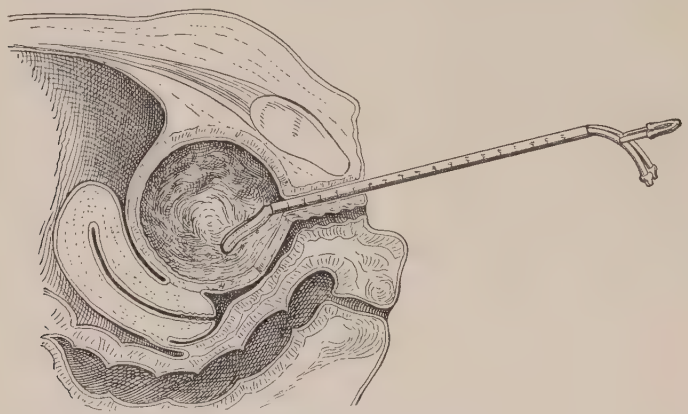


FIG. 614.—SEGREGATION OF THE URINE.
Shows Harris's segregator introduced into the bladder as a single continuous shaft.

catheters by means of a fork attachment and its distal end held between the vesical ends of the segregator by a spiral spring, thus forming a watershed at the base of the bladder which separates the ureteral orifices. The rubber tubing connecting the proximal ends of the segregator is now removed and the retained

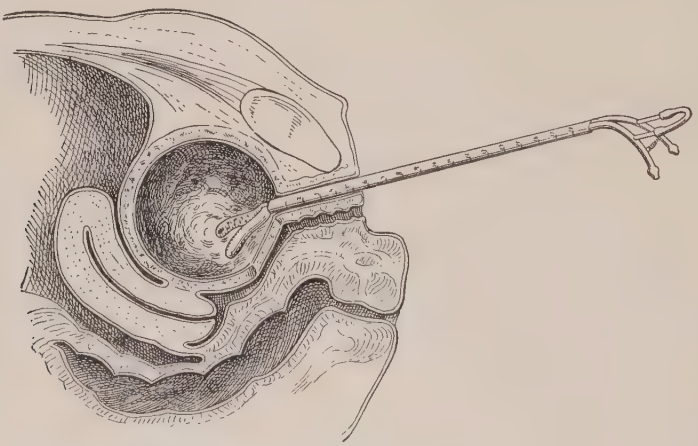


FIG. 615.—SEGREGATION OF THE URINE.
Shows the vesical ends of the segregator separated and lying close to the ureteral orifices.

fluid allowed to escape from the bladder. The vials are then attached to the catheters by the rubber tubing, and by means of the exhaust bulb the urine is sucked into the catheters as fast as it escapes from the ureters and flows into the receptacles.

Special Directions.—"Aspiration with the bulb should not be too great.

or it will draw the mucosa into the openings of the catheter. Very slight aspiration is all that is necessary. As a few drops of fluid are apt to remain in the bladder even after the use of the catheter, the first few drops that come over should be discarded. The instrument should be opened carefully when in the bladder so as not to excite hemorrhage by injuring the mucosa. The distal curve should be just within the bladder, which is determined by noting the length of

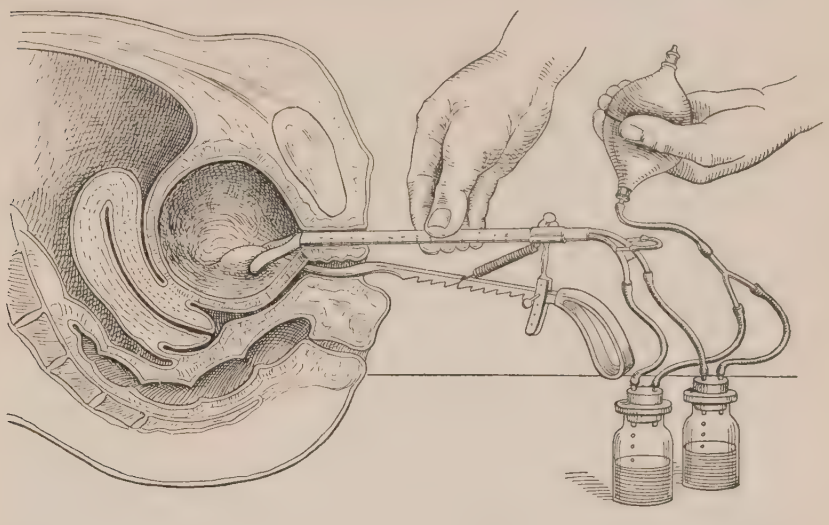


FIG. 616.—SEGREGATION OF THE URINE.
Shows the segregator and its attachments in position and the operator compressing the exhaust bulb.

the urethra on the scale. Pass the instrument into the bladder and open it before introducing the lever into the vagina. The ends of the catheters are easily felt through the vagina and the lever should be directly in the middle, midway between the two ends and pressed snugly into the angle. The pressure should not be sufficient to cause pain, as the watershed is very easily formed. The urine does not drop continually into the vials, but intermittingly, just as it escapes from the ureters" (Harris).

CHEMIC, MICROSCOPIC, AND BACTERIOLOGIC EXAMINATIONS.

Limitations.—These methods of investigation are limited to the examination of ureteral discharges.

Information.—We can determine the character of the infection in renal and ureteral inflammation.

Technic.—The urine and the ureteral discharges are obtained by catheterizing the ureters and collecting them directly in sterile bottles which are sent to a pathologist for examination.

THE X-RAYS.

This method of investigation is used to determine the presence of a ureteral calculus. The technic of the examination will be found in special works on the *x*-rays, and need not therefore be discussed here.

MALFORMATIONS OF THE URETERS.

Anomalies or malformations of the ureters are very seldom met except at autopsies or on the dissecting table. This is due not only to the fact that they are extremely uncommon, but also because they rarely give rise to symptoms or have any pathologic importance.

The following anomalies have been described:

Duplication.
Abnormal implantation of the orifices.
Occlusion.

DUPLICATION.

A duplicated or double ureter is the most frequent malformation met, and it may be either *complete* or *partial*. In the former case each ureter arises from an individual pelvis and enters the bladder without fusing with its fellow. Usually, however, the orifice of one of the ureters is occluded and a partial hydronephrosis is present.

In a partial duplication, on the other hand, the ureters may arise from individual pelves, but, fusing lower down, they enter the bladder as a single tube, or

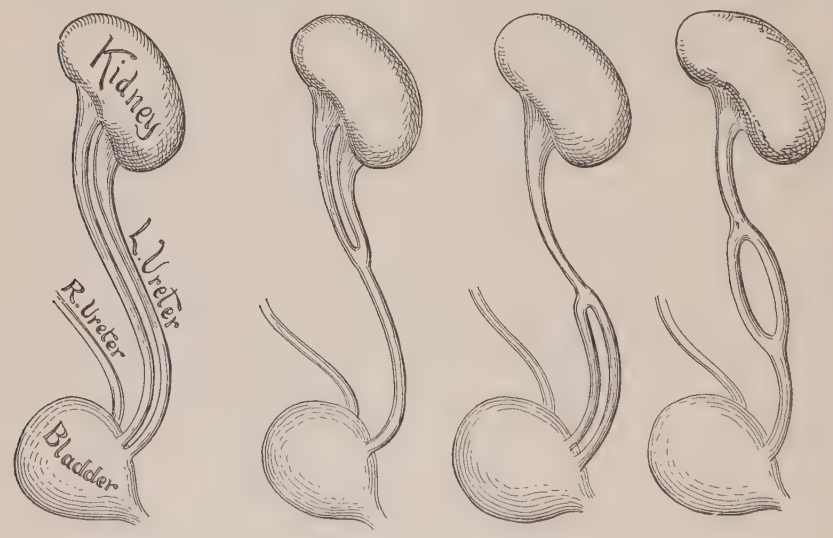


Fig. 617. Fig. 618. Fig. 619. Fig. 620.

Malformations of the Ureters.

Fig. 617 shows a complete double ureter; Figs. 618, 619, and 620 show different forms of a partial double ureter.

the division may occur below the kidney and the ureters either continue as separate ducts or they may unite again before penetrating the vesical wall.

Symptoms.—These malformations cause no subjective or objective symptoms, unless a partial hydronephrosis occurs as the result of occlusion of the vesical orifice of one of the ureters. This subject will be fully discussed in considering the malformations due to occlusion.

Treatment.—No treatment is indicated except in cases of partial hydronephrosis from occlusion.

ABNORMAL IMPLANTATION OF THE ORIFICES.

The orifice of one of the ureters may open abnormally in the urethra, the vagina, or upon the surface of the vulva near the external urinary meatus.

Symptoms.—The patient gives a history of constant involuntary dribbling of urine from birth. The urine also accumulates in the bladder, and although it is voided at regular periods the total amount passed in twenty-four hours is less than the average.

Diagnosis.—If the incontinence or dribbling of urine has existed from birth, it is due to a congenital malformation, and the next question to decide is the origin of the involuntary discharge. Incontinence of urine occurring primarily in an adult is always acquired, and we must therefore look for other than congenital causes. Having decided from the history of the patient and the absence of any acquired cause that the condition is congenital, we must then carefully examine the patient to determine whether the abnormal implantation of the orifice of the ureter is in the urethra, the vagina, or upon the surface of the vestibule, and whether any communication exists between it and the bladder.

The patient is placed in the dorsal position and the vagina and the external parts douched with warm sterile water. A perineal retractor is then inserted into the vagina, which is thoroughly wiped dry with a gauze sponge. The retractor is then withdrawn and the surgeon carefully inspects the external urinary meatus and the vestibule for several minutes. If the ureter opens in the urethra, urine will be seen dribbling from the external meatus, and a urethroscopic examination will show the position of the abnormal orifice; but if the adventitious opening is implanted in the vestibule, the urine will be seen escaping intermittently from a small orifice in that situation. If, however, the external parts remain dry, we reintroduce the perineal retractor; and if urine is found in the vaginal culdesac, the situation of the ureteral orifice must be in the vagina. An inspection should now be made of the entire vaginal canal to locate the position of the ureteral opening, which is revealed by an intermittent jet of urine escaping from a small orifice.

Having located the situation of the supposed ureteral opening, we must then determine whether there is any communication between it and the cavity of the bladder. This is accomplished by catheterizing the patient and injecting into the bladder a solution of creolin (0.5 per cent.) or sterile milk and noting the color of the urine as it escapes from the abnormal opening. If no change takes place, the diagnosis of an abnormal implantation of the ureter is rendered certain; but if the color changes to white, the vesical source of the urinary discharge will be established.

Treatment.—The malformation can only be corrected by a surgical operation which will divert the flow of urine and direct it into the bladder. From the standpoint of treatment it is unnecessary to determine whether a complete or partial duplication of the ureter exists or whether the abnormally implanted orifice is the only one draining the kidney, because if there is a duplication and the supernumerary ureter is ligated instead of being turned into the bladder, partial hydronephrosis due to occlusion would necessarily result.

Implantation of the Ureter.—This is accomplished by incising the vagina and dissecting the ureter free as far back as the base of the bladder. A small opening is then made into the bladder through which the end of the ureter is inserted after removing the redundant portion and splitting the orifice. The ureter is then permanently fixed in its new position by stitching it to the wall of the bladder with catgut sutures, and the vaginal wound is finally closed with interrupted silkworm-gut sutures.

Formation of a Fistulous Opening between the Ureter and the Bladder.—The bladder is first opened by a suprapubic incision (see suprapubic cystotomy, p. 965) and the ureter located. An opening is then made through the base of the bladder exposing the ureter, which is split open and the edges of the incision stitched to the bladder wall with interrupted catgut sutures. The ureter is then ligated beyond the false opening and the suprapubic incision closed without drainage.

OCCLUSION.

A congenital occlusion of the ureter is a very rare malformation. In some cases the atresia is due to a flexion in the canal, and in others it is caused by the distal extremity of the ureter ending in a blind pouch or sac. The latter deformity is usually associated with a complete or partial duplication of the ureter, and the abnormal canal either ends in the bladder without dilatation or it forms a sacculated tumor which encroaches upon the cavity of the organ. In some cases the distal end of the ureter has no attachment whatever, and if it becomes dilated forms an ovoid cystic tumor which may be readily palpated through the vaginal vault.

The effect upon the kidney of an occlusion of the ureter varies, and we find in some cases a portion or the whole of the organ atrophied, while in others a partial or a well-marked hydronephrosis may be present.

INJURIES OF THE URETERS.

Causes.—The ureters may be injured by any form of external violence, such as a severe crush or a squeeze of the lower abdomen and the pelvis, and by a bullet or a stab wound. The most frequent injuries, however, occur during a pelvic operation, and it is not a rare occurrence for the ureters to be wounded or ligated or clamped when a tumor or the uterus or both are removed by either the abdominal or the vaginal route. Serious injuries are likewise apt to occur, in the hands of an inexperienced surgeon, during operations upon the anterior wall of the vagina, and it is not an uncommon occurrence under these circumstances for the ureters to be accidentally cut or ligated.

Varieties.—Wounds of the ureter may be either (*a*) incised, (*b*) contused, or (*c*) lacerated.

An **incised wound** may completely divide the ureter or it may only partially cut through it in a transverse or longitudinal direction. This variety of wound may be caused by an accident during an operation or in rare instances by a stab.

A **contused wound** is caused by unintentionally ligating or clamping the ureter and by external violence.

A **lacerated wound** may occur during the enucleation of a pelvic mass or from the penetration of a bullet.

Symptoms and Diagnosis.—The symptoms depend upon the character and extent of the traumatism. Injuries caused by external violence, even where the ureter is ruptured, cannot be diagnosed in the beginning because the symptoms are masked by those dependent upon wounds in adjacent organs. Usually, however, the patient complains of pain and tenderness in the lumbosacral region; micturition is frequent and painful; the amount of urine is diminished; and hematuria is generally absent unless the kidney is also involved. In the course of a few days or weeks, if the patient survives her injuries, an indistinct, boggy tumor may be felt at some point along the course of the ureter, which is occasioned by the extravasated urine around the seat of rupture. In the case of a gunshot or stab wound involving the ureter the nature of the injury may be suspected

from the situation of the wound, the diminished amount of urine, and the absence of hematuria. In some instances the urine may escape from the entrance of the wound and thus confirm the diagnosis.

Wounds occasioned by a faulty operative technic are usually less difficult to recognize because of the acuteness of the symptoms and the history of the case. If the ureter is wounded during an operation on the anterior wall of the vagina, a ureterovaginal fistula results and there is a constant dribbling of urine. The same condition may likewise follow an injury during a pelvic operation by the vaginal route if the urine succeeds in finding an outlet through the vagina. Usually, however, when the ureter is wounded during a pelvic operation, especially by the abdominal route, a fistulous communication with the vagina is very seldom formed, and consequently extravasation of urine occurs into the surrounding tissues which may be felt by bimanual palpation as an indistinct, boggy tumor or mass.

The accidental ligation or clamping of one ureter during an operation may be followed by acute hydronephrosis, which manifests itself by a severe, sharp pain extending from the region of the kidney to the base of the bladder, and is accompanied by chills, elevation of temperature, rapid pulse, vomiting, and extreme restlessness. On the other hand, however, there may be an entire absence of all symptoms and the patient makes an uninterrupted recovery. Under these circumstances the kidney gradually becomes atrophied without causing constitutional disturbances, and nothing remains but a slightly dilated pelvis and ureter. Again, the symptoms of ureteral occlusion may be so completely masked by those dependent upon other post-operative complications that the accident to the ureter may not be even suspected, and there is no doubt whatever that in many instances in which death has been attributed to sepsis or shock the true cause has been an injury to one or both ureters. The amount of urine voided by the bladder is always diminished in cases in which one ureter has been ligated or clamped. The diagnosis depends upon the nature of the operation and the possibility of injuring a ureter; the symptoms of acute hydronephrosis when they are present; and the diminished amount of urine. If the latter symptom is due to ureteral occlusion, Harris's segregator will demonstrate the fact that urine only collects in one side of the bladder.

When both ureters are ligated or clamped acute hydronephrosis may develop, or the only symptom in many cases for the first day or two will be suppression of urine, which is shortly followed by *uremia* and *death*. The diagnosis depends upon the nature of the operation and the possibility of injuring the ureters; the symptoms of acute hydronephrosis when they are present; the suppression of urine; and the uremic phenomena.

Treatment.—The treatment of wounds of the ureter, whether due to violence or to an accident at the time of an operation, is purely surgical in character and has for its object the restoration of the function of the canal. To accomplish this purpose, several operations have been devised to meet the indications, which naturally depend upon the character and situation of the wound. I shall, therefore, describe these operations separately, and at the same time point out the indications for their selection. Before doing so, however, it should be clearly understood that the restoration of the function of the ureter must be undertaken surgically as soon as the diagnosis of an injury is made, and that the principles underlying the treatment are the same whether the injury is due directly to a wound or whether it is caused by the accidental application of a ligature or a clamp.

The following operations are indicated in the treatment of wounds of the ureters:

Ureterorrhaphy.
Uretero-ureterostomy.
Ureterocystostomy.
Ureterostomy.
Nephro-ureterectomy.

Ureterorrhaphy.—This is the simplest of all operations on the ureter and consists in suturing a wound in its wall. The operation is therefore indicated when the ureter is simply incised or cut in a longitudinal or transverse direction.

T e c h n i c.—After exposing the wound its edges are united by interrupted sutures of fine silk, which should include all the structures except the mucous membrane. The peritoneum is then drawn over the seat of operation and held in position by a continuous silk suture.

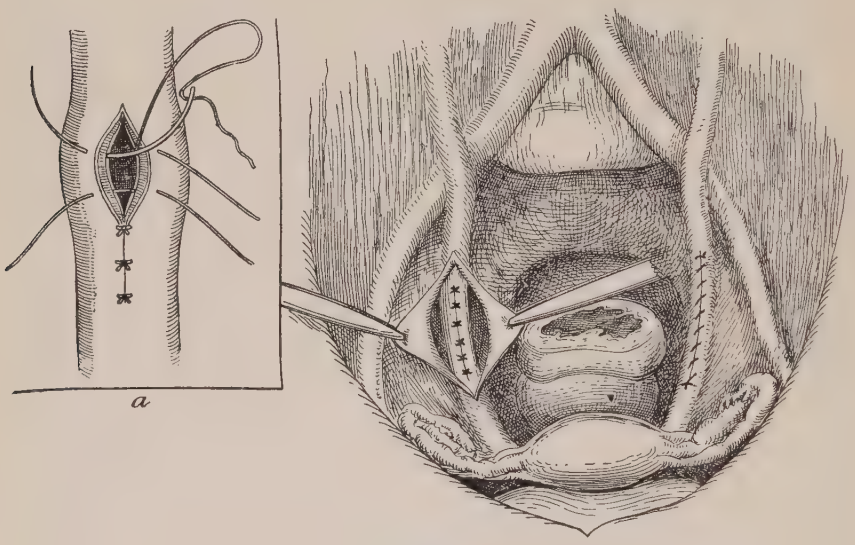


FIG. 621.—URETERORRHAPHY.

Shows the wound in the right ureter sutured and the peritoneum retracted with forceps. On the left side of the pelvis the peritoneum is shown drawn over the seat of operation and held in position by a continuous silk suture. Illustration *a* shows in detail the method of suturing the ureteral wound. Note that the sutures do not penetrate the mucous coat of the ureter.

Uretero-ureterostomy.—This operation consists in making an anastomosis between the divided ends of the ureter. It is indicated when the ureter is completely divided and the division is not situated close to the bladder, otherwise the lower end is too short to permit an anastomosis with the upper end.

T e c h n i c.—The best method of making an anastomosis is that devised by Van Hook, which consists in implanting the upper into the lower end of the divided ureter. The steps of the operation, which are shown in Fig. 622, are as follows: The lower end of the ureter is closed with a silk ligature and an incision is then made in its wall large enough to receive the upper end. Two needles are now threaded with a catgut suture and passed from within outward through the wall of the upper end of the ureter near its opening, which has been previously enlarged by a short slit in the opposite wall. The

suture is then passed from within outward in the same way through the wall of the lower end of the ureter about half an inch below the angle of the incision nearest the bladder. The upper end of the ureter is now gradually passed through the incision in the lower portion and the suture drawn taut and tied on the outside. The anastomosis is then made secure by stitching the upper end of the ureter to the edges of the incision in the lower portion with interrupted catgut sutures and by protecting the seat of operation with a covering of peritoneum.

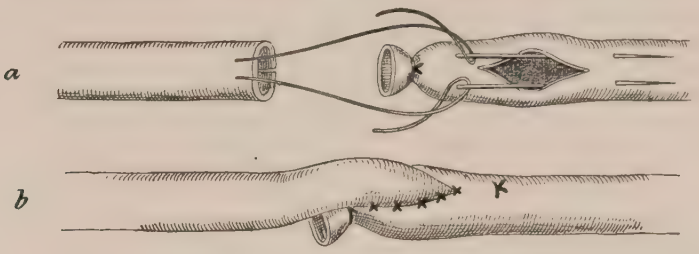


FIG. 622.—URETERO-URETEROSTOMY BY VAN HOOK'S METHOD.
Illustration *a* shows the method of introducing the suture through the distal and proximal ends of the ureters; illustration *b* shows the anastomosis completed.

Ureterocystostomy.—This operation consists in making an anastomosis between the upper end of the divided ureter and the bladder. It is indicated when the ureter is completely divided and the division is situated close to the bladder, otherwise uretero-ureterostomy should be performed, as the traction would be too great at the seat of operation.

T e c h n i c.—The lower end of the divided ureter is ligated with silk and an opening made in the bladder large enough to receive the upper end of the canal.

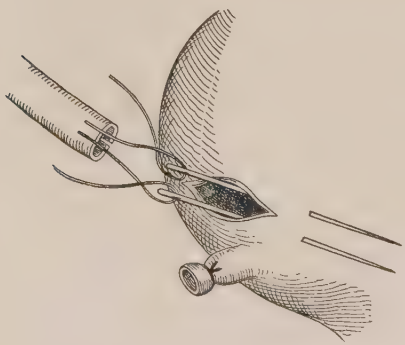


FIG. 623.

FIG. 624.

URETEROCYSTOSTOMY BY VAN HOOK'S METHOD.
Fig. 623 shows the method of introducing the sutures into the ureter and bladder; Fig. 624 shows the anastomosis completed.

The opening in the bladder should be made in such a position that there will be a minimum amount of traction upon the implanted ureter. The introduction of the sutures, the implantation of the upper end of the ureter, and the additional sutures employed to secure the anastomosis are the same as in uretero-ureterostomy, and are shown in Fig. 622.

Ureterostomy.—This operation consists in making an artificial ureteral fistula by ligating the lower and implanting the upper end of the torn ureter into

the vagina or rectum or upon the skin surface in the neighborhood of the kidney. It is indicated when the wound of the ureter is so extensive that a ureteroureterostomy or a ureterocystostomy cannot be performed, and when the patient is unable to stand the shock of a nephro-ureterectomy. When the condition of the patient has improved, however, the removal of the kidney and the ureter should be undertaken, and in the meantime the urine is allowed to escape through the fistulous opening. The danger of an ascending infection must always be borne in mind when the implantation of the ureter is made into the rectum.

Technic.—The operative technic is very simple and the implantation should usually be made upon the skin surface of the loin. After ligating the lower end of the ureter with silk, the upper portion is dissected free and a small incision made from within outward in the loin. A narrow forceps is now passed through this incision from without and the end of the ureter seized and pulled through the opening. The ureter is then stitched to the skin with catgut and the abdominal incision closed.

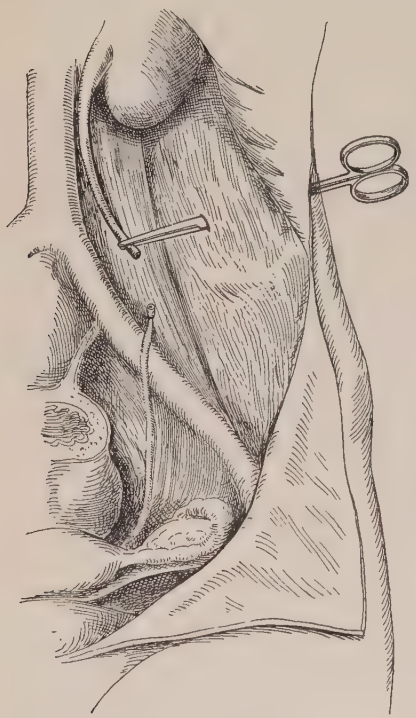


Fig. 625.—Ureterostomy.

Nephro-ureterectomy.—This operation consists in removing the kidney and a whole or a part of the ureter. It is indicated when the injury to the ureter is so extensive that it is impossible to restore its function. The operation should be performed at once if the condition of the patient is good, otherwise it should be postponed and a temporary ureteral fistula made.

Technic.—The operation has no gynecologic peculiarities and the reader is therefore referred to works on genito-urinary surgery for a description of the operative technic.

Accidental Ligation of the Ureters.—If one or both of the ureters are ligated or clamped during an operation and the accident is discovered at the time, the ligature or clamp should be immediately removed and the patient closely watched for several days for signs of urinary leakage.

When the accident occurs upon the anterior wall of the vagina, no immediate harm results if a urinary fistula does occur, and there is consequently nothing to be done beyond watching the patient and operating later if necessary.

If, however, the ureter is occluded during a pelvic operation, a glass drainage tube should be inserted into the pelvis through the abdominal incision, or, if the vaginal route is employed, a drain of gauze should be inserted through an opening in the vault of the vagina to guard against urinary infiltration and enable the surgeon to immediately recognize a rupture if it occurs in the ureteral wall.

The effect of a ligature on a ureter, if it is removed at the end of the operation, cannot always be determined. In most cases it will do no harm whatever; in others a urinary fistula results; or, again, it may cause a stenosis or an atresia

of the ureteral canal. A clamp, on the other hand, causes more traumatism, and the consequent crushing of the tissues is apt to be followed by a fistula or a more or less complete occlusion of the ureter.

Drainage in Ureteral Operations.—If the operative technic has been carefully carried out, drainage will seldom be required in operations on the ureters; sometimes, however, owing to the local conditions in a particular case, it may be found necessary to use a glass tube or gauze to guard against urinary infiltration should leakage occur.

Method of Determining which Ureter is Injured.—The importance of determining which ureter is injured before opening the abdomen is frequently overlooked by operators, and as a result valuable time is lost in locating the site of the traumatism. To obviate this difficulty, Harris's segregator is introduced into the bladder (see p. 669) and the side from which no urine is collected will be found to correspond with that of the injured ureter.

DISEASES OF THE URETERS.

STRICTURE.

Causes.—Strictures of the ureter result from cicatricial contractions following an attack of ureteritis or the passage of a renal calculus, and from external violence or the temporary crushing caused by a ligature or a clamp during a pelvic operation.

Description.—A stricture may cause complete or partial occlusion of the ureter and it may be located in any part of the canal, although it is most frequently found in the neighborhood of the bladder or the pelvis of the kidney. In some cases there may be only one stricture present, while in others the ureteral canal may be occluded in several places.

Symptoms.—The symptoms depend upon the character of the obstruction and the presence or absence of infection. In an aseptic case where the occlusion is not complete no symptoms whatever may be present, but if the stricture prevents the escape of urine the symptoms of hydronephrosis eventually manifest themselves and the amount of urine voided by the bladder is diminished. If, however, infection takes place and a pyoureter and a pyonephrosis develop, pain is felt along the course of the ureter, a swelling is formed in the region of the kidney which is tender and painful to the touch, and the purulent accumulation gives rise to general septic symptoms—*rapid pulse, fever,* and *exhaustion.*

Diagnosis.—The diagnosis is based upon the physical signs, which are elicited by (*a*) touch; (*b*) the use of Harris's segregator; (*c*) sounding the ureter; and (*d*) abdominal palpation.

Touch.—If the ureter is found upon palpation through the rectum or vagina to be enlarged and thickened, the probability of the existence of an inflammatory stricture should be considered.

Harris's Segregator.—This instrument is introduced into the bladder, and if no urine is collected from one side a stricture probably exists in the corresponding ureter.

Sounding the Ureter.—A metal catheter may be used for sounding the vesical end of the ureter; but for its upper or renal portion a long flexible catheter is required.

The catheter should be introduced slowly until it meets with an obstruction; it is then gradually pushed beyond this point, and if urine suddenly escapes in a steady stream the diagnosis of a stricture is confirmed. The amount of urine escaping through the catheter being

greater than that which is normally excreted by the kidney in the same length of time proves the presence of a hydroureter and a hydronephrosis.

Abdominal Palpation.—In infected cases associated with complete occlusion palpation over the region of the pelvis of the kidney and along the course of the ureter will reveal the presence of a tender and painful enlargement. In aseptic cases the tumor is usually neither painful nor tender to the touch.

Prognosis.—Occlusion of the ureter results in hydroureter and hydronephrosis, and eventually atrophy of a portion or the whole of the kidney may take place which lessens or completely suppresses the excretion of urine. If infection occurs, a pyoureter and a pyonephrosis develop.

Treatment.—The treatment of stricture of the ureter depends upon the situation, the character, and the results of the obstruction, as well as upon the absence or presence of infection.

The following methods of treatment have been successfully adopted in appropriate cases:

Dilatation.
Division.
Resection.
Local medication of the ureter.
Nephrectomy.
Expectant treatment.

Dilatation.—A dilatable stricture situated near the vesical end of the ureter may be dilated with a metal catheter; if, however, the obstruction is in the middle

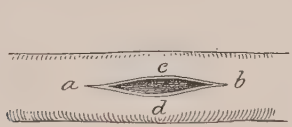


Fig. 626.

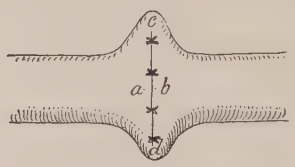


Fig. 627.

Fenger's Method of Dividing a Ureteral Stricture.

Fig. 626 shows a longitudinal incision through the ureteral wall and the stricture; Fig. 627 shows the method of suturing the incision so as to increase the caliber of the stricture; note that the angles of the wound *a* and *b* are united.

or upper portion of the canal, a long flexible catheter must be used. The instrument should be passed once a day, beginning with a No. 2 catheter (2 millimeters in diameter) and gradually increasing the size up to No. 5 or 6.

The result of gradual dilatation in suitable cases is very satisfactory in many instances, the patient experiencing decided relief from pain, and the obstruction to the flow of urine is greatly diminished. It should, however, be borne in mind that a stricture which has been fully dilated may still obstruct the flow of urine if the ureteral walls remain relaxed and flabby.

Division.—A tight stricture which cannot be dilated by a metal or flexible catheter should be divided according to *Fenger's method*. This consists in making a longitudinal incision through the ureteral wall and the stricture and suturing the angles and sides of the wound together so as to increase the lumen of the ureter at that point.

Resection.—Resection of the ureter at the seat of obstruction followed by uretero-ureterostomy (Van Hook's method) is indicated in cases in which the stricture is not dilatable or where Fenger's method is not applicable on account of the extent and character of the occlusion.

Local Medication of the Ureter.—Gradual dilatation followed by local

medication of the ureteral canal is indicated in cases in which the stricture is associated with infection and where there is either a discharge of pus from the ureter into the bladder or where a pyoureter or a pyonephrosis is present. We are indebted to the brilliant investigations of Kelly in the domain of ureteral surgery for this method of treatment, which he has ingeniously devised and successfully carried out with the result of greatly improving and in some instances in curing the pathologic conditions.

Kelly first gradually dilates the ureter until it allows the introduction of a No. 6 catheter (6 millimeters in diameter), and then begins "systematically to wash out the ureter and kidney with a bichlorid of mercury solution (1:150,000), constantly increasing the strength until 1:16,000 is used, and occasionally substituting for the bichlorid a 1 per cent. nitrate of silver solution and a weak iodin solution."

In describing the method of giving the ureteral injections in one of his earlier cases Kelly says: "After drawing off all the fluid, a piece of fine rubber tubing

Fig. 628.

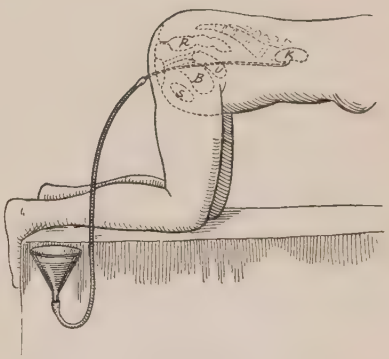


Fig. 629.

Method of Giving Injections into the Pelvis of the Kidney. (Modified from Kelly.)
Fig. 628 shows the fluid running into the pelvis of the kidney; Fig. 629 shows the return flow started by lowering the reservoir.

with a funnel at the end was connected with the catheter, and a saturated boric-acid solution, equal to two-thirds of the quantity of fluid taken out, was run into the ureter by gravity by simply elevating the funnel filled with the fluid from 40 to 60 centimeters above the level of the bladder. Care was taken to have the tubes full of fluid, so as not to inject air. The patient, during all these manipulations, was in the knee-breast position. She took no anesthetic, as the treatment was not painful. After the catheter was in the ureter she raised herself on her hands and knees to dispose the fluid to run out faster. When the injection was given, she again let her chest down to the table, and rose again when it was to flow out. I found that I could wash the urinary tract repeatedly with the same fluid, if I desired it, by holding the funnel high for the fluid to run in, and by holding it an equal distance below the level of the table for it to run out again, often bringing with it a considerable amount of shreddy white debris from the ureter."

Nephrectomy.—Extirpation of the kidney is indicated in cases of stricture only when the ureter becomes so diseased and disorganized that its function is entirely lost.

Expectant Treatment.—In cases of stricture of the ureter in which the kidney has become completely atrophied no form of treatment is indicated unless the ureteral canal and the pelvis of the kidney are distended with pus or the patient suffers pain. Under these circumstances the fluid should be evacuated through an incision in the loin, and if necessary the kidney should be removed.

Special Treatment.—In treating strictures of the ureter the condition of the mucous membrane of the bladder must be carefully determined, and if cystitis is present it should be treated at the same time.

CALCULI.

Causes.—Calculi are not so commonly met in the ureter as in the pelvis of the kidney or in the bladder. In the majority of cases they come from the pelvis of the kidney and are arrested somewhere in the course of the ureteral canal during their passage toward the bladder. In rare instances, however, the stone may form in the ureter itself, and cases have been observed in which urinary salts were deposited around a silk ligature used in making a ureteral anastomosis.

Situation.—A ureteral calculus may become impacted in any part of the canal, but it is most frequently arrested either immediately below the pelvis of the kidney, at the pelvic brim, or close to the bladder.

Description.—Ureteral calculi are elongated in shape; they usually have a ragged irregular outline; and in some instances there is a shallow longitudinal indentation on the side made by the urine in flowing past the obstruction. After a calculus has been arrested in the ureter for some time, it becomes very much lengthened out from the deposit of urinary salts at its ends and from the loss of substance by friction at the sides.

Results.—The effect of a calculus on the ureter and the kidney depends largely on its shape, character, and size. In some cases the obstruction is not sufficient to interfere with the flow of urine, while in others the urine is more or less dammed back, causing a dilatation of the ureter and the pelvis of the kidney (*hydroureter* and *hydronephrosis*); and if infection subsequently takes place, the collection of fluid becomes purulent in character (*pyoureter* and *pyonephrosis*). In cases of complete obstruction the usual atrophic changes eventually occur in the kidney, and its excretory function is impaired or destroyed altogether, according to whether these changes involve the whole or only a portion of the organ. A large, rough, irregular stone may cause an ulceration of the ureteral walls and result in the formation of a fistula.

Symptoms.—The symptoms of ureteral calculi may manifest themselves either in an *acute* or a *chronic form*. The acute symptoms are caused by the passage of the calculus through the ureter, and they disappear suddenly when the stone reaches the bladder; but if it becomes impacted, they become chronic in character, although subsequent attacks may occur should the foreign body be dislodged and again descend along the ureter.

The *acute symptoms* are those of ureteral colic, namely—agonizing pain along the course of the ureter from the pelvis of the kidney to the bladder, rapid pulse, nausea, vomiting, and often collapse. In some cases these phenomena are accompanied by chills and moderate fever. As the attack subsides the pain lessens in severity, and if the stone has become impacted the urine is diminished in amount or temporarily suppressed, and a fluctuating mass may at times be felt in the region of the kidney. During an attack of ureteral colic the patient is often able to describe the course of the calculus as it descends along the canal by the position of the pain. Hematuria is often present in acute renal colic.

The *chronic symptoms* are characterized by a dull ache or pain along the course of the ureter, which is particularly severe at or near the location of the stone. If the obstruction interferes with the flow of urine, symptoms of hydroureter and hydronephrosis arise; and should infection occur under these circumstances, the local and constitutional manifestations of dammed-up pus show themselves. Sometimes the stone is more or less movable and acts as a ball-valve which causes what is known as an *intermittent hydronephrosis* or the alternate retention and escape of urine.

Diagnosis.—The diagnosis of an *acute attack* of ureteral colic due to the passage of a calculus is usually not difficult, as the symptoms described above are sufficiently characteristic and constant to enable the surgeon to suspect the nature of the affection. In a *chronic case*, however, the symptoms are not definite, and as they are often present in other pelvic lesions, they assist very little toward making the diagnosis unless the patient gives a clear history of a previous attack or attacks of acute ureteral colic. A positive diagnosis in both the acute and chronic cases is therefore possible only when the stone can be definitely located by means of a direct examination.

The presence of a ureteral calculus may be determined by the following methods:

Vaginal touch.
Rectal touch.
The use of a ureteral catheter or sound.
The use of the cystoscope.
An exploratory incision.
The *x*-rays.

Vaginal Touch.—A stone that is impacted in the ureter in front of the broad ligament can usually be palpated and recognized through the vagina.

Rectal Touch.—A calculus located in the ureter posterior to the broad ligament can be felt through the rectum as far up as the brim of the pelvis.

The Use of a Catheter or Sound.—A stone occupying the lower portion of the ureter can be located by a metal catheter, which is arrested when the tip of the instrument reaches the obstruction, and the contact can be both felt and heard by the surgeon.

A calculus occupying the upper or renal portion of the ureter can only be located by a flexible hard-rubber sound the tip of which Kelly covers with a thin layer of dental wax, so that when it comes in contact with the rough edges of the stone, scratch marks are made that can be seen when the instrument is withdrawn (Fig. 609).

The Use of the Cystoscope.—A calculus located at the ureteral orifice and protruding into the bladder may readily be seen through the cystoscope; it is important, therefore, to examine the openings of the ureters as a routine practice in all cases where the presence of a stone is suspected.

An Exploratory Incision.—The presence and location of a calculus may be determined, if necessary, by an exploratory incision, either through the abdominal wall or through the loin over the region of the kidney. In the latter instance, after exposing the kidney and opening its pelvis and drawing off the retained fluid, a long, flexible, wax-tipped sound is passed into the ureter until it meets the obstruction. It is then withdrawn and the coating of wax examined for the presence of the characteristic marks which are made by the rough surface of the stone (Fig. 630).

When an exploratory opening is made through the abdominal wall, the location of the stone is determined by palpating the entire course of the ureter through the incision in the abdomen.

The *x*-rays.—The technic of the examination will be found in special works on the *x*-rays.

Treatment.—Operative treatment is not indicated in every case of ureteral calculus, because the stone may pass into the bladder and give rise to no further trouble. Or, again, a patient may have several acute attacks without the stone finding permanent lodgment in the ureter and thus interfering with the flow of urine. Therefore unless the clinical history of the patient and the direct examination show that the stone has become permanently arrested, nothing should be done in a radical way. When, however, an acute attack is followed by a persistent dull heavy pain somewhere along the course of the ureter, or the urinary excretion is diminished in amount and Harris's segregator collects the urine from only one side of the bladder, or a tumor is discovered in the region of the kidney, we must at once relieve the obstruction by surgical means.

The treatment of ureteral calculus should therefore be divided into:

The treatment of acute ureteral colic.

The treatment between the attacks.

The removal of the stone by operation.

The Treatment of Acute Ureteral Colic.—The patient should be given a full hot bath, hot fomentations or a hot-water bag should be applied over the kidney and the course of the ureter, and full hypodermic doses of morphin and

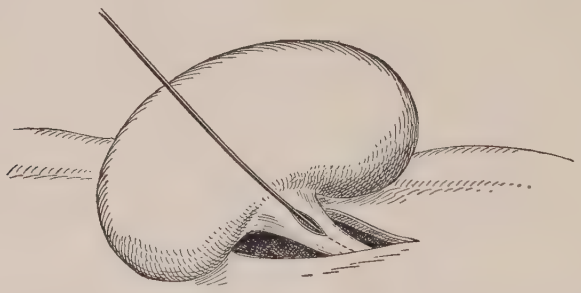


FIG. 630.—DIAGNOSIS OF A URETERAL CALCULUS (page 683).
Shows the kidney delivered through an incision in the loin, the pelvis opened, and a long, flexible, wax-tipped sound passed into the ureter.

atropin should be administered. Decided relief is also obtained by drinking hot water or hot lemonade in large quantities, and if the pain becomes unbearable, inhalations of chloroform must be resorted to.

The pain is sometimes greatly benefited and the paroxysm shortened by a hot sitz-bath, which should be continued for at least thirty minutes and the patient protected with a light woolen blanket.

The Treatment between the Attacks.—The hygienic, dietetic, and medicinal treatments are very important and should be thoroughly carried out in every case, as much may be accomplished by these means in preventing the occurrence of subsequent attacks.

The patient should exercise regularly in the open air by systematically walking every day and increasing the distance gradually as her strength improves. Horseback-riding and cycling are also beneficial forms of exercise, and may be indulged in with moderation. Indoor exercises (see p. 117) are especially indicated, and are of great value in lessening the tendency to the formation of a calculus, particularly when they are followed at night by a Turkish (see p. 88) or a full hot bath (see p. 83). The benefit derived from the systematic use

of Turkish baths cannot be overestimated, if they are given properly and carefully regulated according to the indications in each case.

The diet of the patient must be carefully considered and all articles of food having a tendency to the formation of uric acid should be forbidden; cream and butter are the only forms of fat allowed. Overeating should be likewise interdicted, and the use of alcohol, especially the red wines and champagnes, should not be permitted. A good Scotch or rye whisky is the least harmful form of alcohol in these cases, and may be used in moderation.

The patient should drink a large amount of pure water every day (from six to ten glasses), and for this purpose distilled water is probably the best, on account of its absolute purity and freedom from earthy salts, although good results are also obtained from the use of Bedford, Poland, and Saratoga waters, as well as Buffalo and Londonderry lithia waters. The Carlsbad and Vichy waters are especially beneficial on account of their alkalinity, which corrects the acidity of the urine and renders it non-irritating.

While there is no evidence for believing that a stone once formed in the pelvis of the kidney can be dissolved by means of drugs, yet there is no doubt whatever that certain remedies are prophylactic in their action and lessen the tendency to the formation of calculi. Phosphate of sodium is the most valuable of these remedial agents, and it is best administered in the form of an effervescent salt before retiring for the night and immediately on getting up in the morning. Carlsbad Sprüdel Salt in doses of one to two drachms well diluted and taken before breakfast is often followed by good results and should be employed in properly selected cases. And, finally, hydrochloric acid alone or combined with tincture of nux vomica may be used as a routine method of treatment.

The Removal of the Stone by Operative Measures.—A calculus may be removed from the ureter by one of the four following routes:

A lumbar incision.
An intraperitoneal incision.
A vaginal incision.
Through the ureteral orifice.

Lumbar Incision.—This route should be selected when the stone is located above the superior strait and when the ureteral canal is infected. As the peritoneal cavity is not opened, there is little or no danger of peritonitis following the operation, and in case of a fistula developing the urine can escape through the incision in the loin.

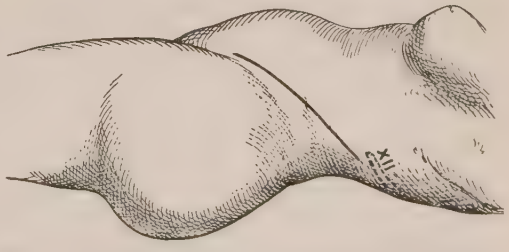


Fig. 631.—Situation of the Lumbar Incision for Exposure of the Left Kidney and Ureter.

Technic.—To expose the ureter an incision is made beginning immediately below the last rib at the edge of the quadratus muscle, and, extending obliquely downward to the crest of the ilium, it is carried forward as far as the anterior superior spine. When the fatty tissue overlying the peritoneum is exposed, the edges of the wound are firmly retracted while the operator separates the structures with his fingers and lays bare the ureter. If there is any difficulty in finding the ureter, it should be made taut by traction upward upon the pelvis of the kidney

and tracing it from above downward. After locating the stone by direct palpation a longitudinal opening is made in the ureter just above or beyond the stone, which is removed and the incision immediately closed with interrupted catgut sutures (*ureterorrhaphy*), which should not include the mucous membrane. The incision in the loin is then closed in the usual manner and drained for forty-eight hours with a few strands of silkworm-gut placed at the bottom of the wound and brought out at each end of the opening in the skin.

Intraperitoneal Incision.—This route is indicated when the stone is located between the superior strait and the broad ligament. The danger of peritonitis occurring if the ureteral canal is infected, and the possible escape of urine into the peritoneal cavity should leakage take place, must not be lost sight of in operating by this route.

Technic.—The abdomen is opened either in the median line or along the outside edge of the rectus muscle on the same side as the affected ureter. After locating the stone it is removed, as described above in the extraperitoneal operation, by a longitudinal incision, and the peritoneum drawn over the ureter and secured with a continuous silk suture (Fig. 621). If the ureter is infected or there is danger of leakage, a glass drain should be placed behind the uterus and not removed for at least forty-eight hours.

Vaginal Incision.—This route is indicated when the stone is located beneath the broad ligament or between it and the bladder.

Technic.—The patient is placed in the dorsosacral position, the bladder is emptied, the position of the stone accurately located by palpation, and a perineal retractor introduced into the vagina. An incision is then made through the vaginal wall, directly over the position of the stone, sufficiently long to expose the ureter above and below the calculus. The ureter is then controlled by passing two ligatures beneath it, one above and the other below the stone, which are tied at each end, making two loops about six inches long. These are held taut by the assistant while the operator makes a longitudinal incision in the canal and removes the stone. He then closes the opening as described above in the extraperitoneal operation. If the ureteral canal is not infected, the vaginal wound is sutured at once; otherwise it should be left open to guard against suppuration. After extracting the stone a ureteral catheter should be passed up the canal to determine the presence or absence of additional calculi.

Through the Ureteral Orifice.—This route is indicated when the stone partially projects beyond the ureteral orifice into the bladder.

Technic.—The end of the stone is first exposed to view with the cystoscope and then seized with forceps and drawn into the bladder, at the same time assisting the extraction by pressure upon the ureter through the vagina. If this is successful, the stone is then removed from the bladder with forceps by pulling it through the cystoscope; but if the calculi cannot be extracted from the orifice of the ureter, it must be removed by the vaginal route, as described above.

NEOPLASMS.

Tumors of the ureter may be either *primary* or *secondary* in origin.

Primary neoplasms are exceedingly rare; small cysts, polypoid growths, cancer, sarcoma, and gumma have been described.

Secondary neoplasms are not infrequently met and are usually due to the extension of a malignant growth of the bladder, the pelvis, or the kidney.

Symptoms.—Small cysts and polypoid growths cause no symptoms whatever except in rare instances, when they are complicated by hematuria. Sometimes, however, symptoms of ureteral obstruction manifest themselves, when the growth blocks up the canal and interferes with the flow of urine. This is espe-

cially apt to happen in cases of primary or secondary tumors of a malignant nature and in large benign growths.

Treatment.—The treatment of ureteral neoplasms is based upon general principles. Usually their presence is not suspected, but if obstruction occurs and they are discovered at the time of an exploratory operation, they may either be removed through a longitudinal incision in the ureteral wall or resection of the ureter may be performed at the site of the tumor and the canal restored by a uretero-ureterostomy (Van Hook's method).

Primary malignant growths are usually too far advanced when they are discovered to permit a radical operation being performed, and surgical interference is likewise contraindicated in secondary tumors on account of the surrounding disease.

FOREIGN SUBSTANCES.

In addition to calculi, which have been already described, the ureteral canal may be obstructed by blood-clots, an echinococcus cyst, or pus originating in the kidney.

The **symptoms, diagnosis,** and **treatment** are the same as in cases of ureteral calculus.

OCCLUSION FROM EXTERNAL PRESSURE.

Causes.—The chief causes of this variety of ureteral obstruction are:

Pelvic tumors.
Inflammatory exudates.
Malignant infiltrations.
Inflammatory adhesions.
Tumors of the bladder.
Chronic cystitis associated with a thickened and contracted bladder wall.

Description.—The obstruction usually involves both ureters, as the most common causes act bilaterally—for example, malignant infiltrations and fibroid tumors of the uterus. Sometimes, however, the cause is unilateral, and therefore does not affect the opposite ureter.

The ureteral occlusion is situated in nearly all cases between the superior strait and the bladder, for the reason that the causative factors are generally located in the pelvis.

Symptoms.—The symptoms, as a rule, are indefinite, as they are usually more or less completely obscured by those dependent upon the causative lesion. This is especially true in cases of obstruction due to cancerous infiltrations and fibroid tumors of the uterus. When, however, both ureters become occluded, symptoms of uremia intervene which point to the nature of the complication, and in some cases the diagnosis may be suggested or confirmed by the appearance of a tumor in the region of the kidney.

Treatment.—The treatment consists in the removal of the cause. If, therefore, the causative factor is amenable to treatment, the obstruction can be relieved, but otherwise the case is hopeless.

Pelvic tumors, inflammatory exudates or adhesions, and neoplasms of the bladder can be removed by surgical means and the lumen of the ureter restored to its normal size.

When both ureteral orifices are occluded by a thickened or contracted bladder and life is threatened from uremia, the ureter should be exposed by an incision through the vaginal wall, opened longitudinally, and the edges of the

wound stitched to the vagina so that the flow of urine may be unobstructed. The vesical lesions are then treated (see *cystitis* and *contraction of the bladder*), and if recovery takes place, the fistula should be closed and the stream of urine turned back into its normal channel.

Ureteral obstructions caused by malignant infiltration are hopeless, and therefore no form of surgical interference should be undertaken.

URETERITIS.

Causes.—The most frequent forms of ureteritis are caused by an infection which is due either to the staphylococcus pyogenes, the streptococcus pyogenes, the gonococcus, or the tubercle bacillus. The infection may start in the bladder and extend upward, or in the kidney and pass downward into the ureteral canal, and it may begin in the ureter itself when the canal is occupied by a foreign body.

In the majority of cases the inflammation starts in the bladder as an acute or chronic cystitis, and eventually the infection extends to the ureter. As a rule, therefore, the ascending varieties of the affection are caused by the gonococcus, the streptococcus, or the staphylococcus, and a tubercular inflammation of the ureters, which is comparatively rare, generally originates in the kidneys.

Pathology.—The disease presents itself in an *acute* and *chronic form*. The *acute variety* is characterized by hypertrophy of the walls of the ureter, and with swelling and congestion of the mucosa. The *chronic variety* may result either in dilatation or in contraction of the ureteral canal. In the former the pus or urine is dammed up and the ureter above the obstruction becomes elongated and tortuous and its walls thin and translucent. In cases in which contraction takes place the walls of the ureter lose their elasticity and become thickened and hypertrophied. The caliber of the canal is diminished in size by hyperplasia of the connective tissue and the presence of strictures, and the ureter is usually firmly bound down by periureteral inflammation.

Symptoms.—The symptoms are not characteristic and are usually more or less obscured by those depending upon the original source of infection—*the bladder or the kidneys*.

This is especially true in cases of *acute ureteritis* occurring during an attack of active cystitis, and apart from the pain which is felt along the course of the ureter, the symptoms are the same as those caused by the inflammation of the bladder—*frequent* and *painful urination*, *vesical tenesmus*, *pus in the urine*, and *hematuria*.

In *chronic cases*, which are also characterized by frequent and painful urination and tenesmus and pus or blood in the urine, the symptoms are the same as those of cystitis, except that, as in the acute infections, pain is felt along the ureteral canal. When, however, contraction or dilatation of the canal occurs, the symptoms become more marked and evidences of the accumulation of pus or urine above the seat of obstruction eventually manifest themselves (see symptoms of stricture of the ureter, p. 679).

Diagnosis.—The diagnosis cannot be made by the subjective symptoms; but if pain develops along the course of the ureter during an *acute* or *chronic* attack of cystitis, the extension of the infection to the ureteral canal should be suspected.

The diagnosis must therefore be based upon the physical signs, which are elicited by (*a*) vaginal touch; (*b*) rectal touch; (*c*) abdominal palpation; and (*d*) sounding the ureter.

Vaginal Touch.—The ureter in front of the broad ligament is found upon

palpation to be swollen and tender, and in some instances it may also present a more or less nodular condition. As a rule, the inflamed canal is so painful to the touch that a thorough examination cannot be made without the use of an anesthetic (Fig. 598).

Rectal Touch.—The ureter may be palpated through the rectum from the posterior surface of the broad ligament as far up as the brim of the pelvis and the pathologic changes in the canal noted as described above (Fig. 600).

Abdominal Palpation.—The patient complains of severe pain when pressure is made through the abdominal wall and the ureter is crowded against the brim of the pelvis; in very thin women it may be felt beneath the examining fingers (Fig. 602). The further extension of the inflammation may be demonstrated by the pain which is felt along the ureter as it is palpated upward to the pelvis of the kidney.

Sounding the Ureter.—This method of diagnosis, which is described under ureteral strictures (see p. 679), should only be employed in chronic cases to demonstrate the presence of a dilatation or an obstruction in the canal.

Prognosis.—The prognosis depends largely upon the cause of the infection. A gonorrheal inflammation is always likely to result in a stricture. An acute attack of ureteritis may sometimes run its course without seriously damaging the function of the ureter and causing any important structural changes in its walls. Nothing can be done for a ureteritis which originates from an incurable disease of the bladder or kidneys, as the source of the infection cannot be removed. The effect upon the function of the kidneys and the ureters must be borne in mind when giving a prognosis in chronic cases associated with dilatation or stricture.

Treatment.—The treatment is divided as follows into:

The removal of the cause.

The treatment of the ureteral inflammation.

The Removal of the Cause.—Nothing can be accomplished unless the original source of the infection is removed, and hence when the ureteritis follows a cystitis we must treat the vesical trouble (see p. 634), or if the inflammation has started in the kidneys, our attention should be directed toward relieving the renal complication.

The Treatment of the Ureteral Inflammation.—In *acute cases* no form of local treatment is possible, as medicinal applications cannot be made to the ureteral canal unless a stricture has developed and the ureter becomes dilated. We must, therefore, rely upon the expectant plan of treatment and endeavor to remove the source of infection. In the majority of cases this is situated in the bladder, and the general and local treatments which are instituted for its relief have at the same time a curative effect upon the diseased ureter (see *treatment of cystitis*).

The treatment of *chronic cases* depends upon the character and extent of the pathologic changes in the ureter; this subject is fully considered in discussing strictures (see p. 680).

TUBERCULOSIS.

Causes.—Tubercular inflammation of the ureters is nearly always due to a secondary infection from the kidneys, although in rare instances it may occur as a primary condition.

Pathology.—The ureter becomes thickened and enlarged and nodules develop in its walls which project externally upon the surface and encroach internally upon the caliber of the canal. Eventually the ureteral mucosa becomes ulcerated, giving rise to a well-marked pyonephrosis, and later on the

bladder becomes involved and tubercles are found scattered over the trigone and around the ureteral openings. As the disease progresses the tubercles break down and the entire cavity of the bladder finally becomes affected.

The disease may be *unilateral* or *bilateral;* in chronic cases, as a rule, only one ureter is involved. Occasionally the tubercular inflammation may be limited and only a portion of the ureter affected, but in the majority of instances the disease invades the whole organ and tubercles are found everywhere in the canal from the pelvis of the kidney to the bladder.

Symptoms.—The following are the chief symptoms: (*a*) Pain; (*b*) frequent and painful urination; (*c*) pyuria; (*d*) hematuria; and (*e*) fever.

Pain.—In tubercular inflammation the ureter is exceedingly sensitive, and constant pain along the course of the canal is complained of by the patient.

Frequent and Painful Urination.—These symptoms are always well-marked and are more or less characteristic of tubercular ureteritis. The desire to urinate is often so frequent that the patient is compelled to empty her bladder every few minutes during the day and night, and the act is usually accompanied by severe pain and tenesmus.

Pyuria.—There is always more or less pus present in the urine, and in some cases large quantities of purulent matter may be suddenly discharged at different times (*intermittent pyuria*) when pyonephrosis exists and the pelvis of the kidney empties its contents into the bladder.

Hematuria.—As a rule, no blood is found in the urine during the early stages of the disease; but later on, when ulceration takes place in the ureter and the bladder, it is present in varying amounts, and it is not uncommon for a free hemorrhage to occur.

Fever.—In cases in which pyonephrosis is present and there is an obstruction in the ureter preventing the escape of the pus, a general septic condition intervenes which is accompanied by an intermittent temperature.

Diagnosis.—The diagnosis is based upon the physical signs, which are elicited by (*a*) vaginal touch; (*b*) rectal touch; (*c*) abdominal touch; and (*d*) the use of the cystoscope.

Vaginal Touch.—The ureter anterior to the broad ligament is found to be enlarged, nodular, and exceedingly sensitive.

Rectal Touch.—The ureter between the posterior surface of the broad ligament and the brim of the pelvis also presents the changes described above.

Abdominal Touch.—The ureter is found to be very painful and sensitive when pressure is made through the abdominal wall and it is crowded against the brim of the pelvis; in very thin women the enlarged canal may be distinctly palpated at this point. The course of the ureter above the superior strait may be readily traced by the pain that is elicited from pressure upward over the inflamed organ.

The Use of the Cystoscope.—The characteristic tubercular lesions at the base of the bladder may be readily seen through the cystoscope.

Prognosis.—Unless the diseased ureter and kidney are extirpated early in the course of the affection the patient eventually dies from extension of the disease to the bladder or adjacent and remote organs. When both ureters are involved, death may occur at any time from uremia if the flow of urine is obstructed.

Treatment.—No form of general or local treatment is of any avail, and when the disease is unilateral, the kidney and ureter must be removed at once (*nephro-ureterectomy*); when both sides are involved, nothing can be done.

CHAPTER XXXII.

PHYSIOLOGY.

PUBERTY.

Definition.—Puberty is that period of human life during which a girl develops into a woman.

Age.—In this country puberty usually occurs between the thirteenth and fifteenth years, and in northern climates the average age is sixteen to seventeen, while in hot countries girls begin to menstruate about the ninth year. Heredity is also a determining factor, and experience demonstrates that girls of Latin extraction develop into womanhood earlier than those of Anglo-Saxon descent. And, finally, environment and hygienic surroundings play an important rôle in determining the age of puberty, and for these reasons it occurs earlier in the rich than in the poor, and in city girls than in those who are raised in the country.

Duration.—The physical changes that lead up to puberty are gradual in their development and are not fully completed until the age of twenty, which is called the period of *nubility*, because at that time the individual is fit to conceive and bear children. At the beginning of puberty the girl is capable of reproduction, but she should not be allowed to marry until the full physical development of womanhood is reached and the pelvis and its organs are matured. Early maternity not only increases the dangers of gestation and labor, but it also has an injurious effect upon the child, which is apt to be poorly developed and often dies soon after birth as the result of marasmus. Mothers should therefore not only be taught that puberty does not mean fitness for reproduction, but they should also be reminded of the law of Plato, which says, "A woman may bear children to the State at twenty years of age."

Changes.—As puberty approaches the general contour of the body becomes fuller and more gracefully molded; the voice changes; the hips enlarge; the breasts notably increase in size; the external and internal generative organs develop; hair grows upon the mons veneris and the labia majora; menstruation appears; and the sexual peculiarities are differentiated.

The psychic changes, which are also well marked, have been eloquently described by Parvin, who says: "The girl passing into womanhood puts away childish things; turning from frivolous amusements, from the toys and plays, or from rude sports in which she has found pleasure, she enters a new life, has new thoughts, desires, and emotions. Hitherto she has been living solely in and for the present; but now the future with its lights and shadows, its hopes and fears, makes a large part of her life. She is more sensitive and reserved, and manifests a modest dignity, giving and expecting respect; her individuality becomes more manifest, her sense of duty stronger, and her ambitions greater."

Management.—Puberty is a critical epoch in the life of a woman, and her future health and usefulness depend largely upon her mode of living during this period. The future burdens of maternity require a sound and vigorous constitution, which cannot be obtained without strict attention to the care of the body. The diet should therefore be simple and wholesome, the character and amount of exercise carefully regulated, and overstudy should be strictly forbidden, especially during the menstrual periods.

MENSTRUATION.

Synonyms.—Courses, periods, unwell, menses, menstrual flow, monthly sickness, turns, and monthly flow.

Definition.—Menstruation is an intermittent function which is characterized by a bloody discharge from the uterus. It begins with puberty and ceases with the menopause. It is absent during pregnancy and lactation, although numerous cases have been observed in which periodic hemorrhages have occurred during the entire course of gestation.

Symptoms.—The symptoms are both *general* and *local* in character. Most healthy women are affected more or less by some of the phenomena of menstruation, although the general and local symptoms may be so slight that the flow comes and goes without causing any inconvenience whatever. In others, again, the symptoms are so accentuated that they cannot be considered normal, and a cause for the pathologic manifestations must be sought for.

The **general symptoms** manifest themselves by nervous irritability, which is often hysteric in type, neuralgia, flushes of heat and chilliness, drowsiness and indisposition to active exercise, impaired appetite and digestion, and diarrhea or irritability of the bladder. The breasts are often swollen and painful, the thyroid gland is increased in size, and dark circles appear under the eyes. Some women also suffer with frontal and vertical headache, and not infrequently acne appears upon the skin of the face, neck, or shoulders.

The **local symptoms** often precede the flow, and are characterized by backache and a feeling of weight or fullness in the pelvis.

Changes in the Organs of Generation.—The external organs become congested, swollen, and sensitive and bathed with a more or less profuse discharge. The internal organs also become enlarged and engorged with blood. The vagina is intensely congested and assumes a violet color; the cervix is swollen and softer than normal; the uterus is enlarged and its mucous membrane thrown into folds, and the activity of the cervical and uterine glands is increased. Eventually the superficial epithelial lining of the uterine cavity becomes desquamated, the capillaries rupture, and the menstrual flow appears, which relieves the congestion and causes the local and general symptoms to lessen in severity or disappear altogether. The menstrual discharge comes from the cavity of the uterus and not from the cervical canal, and in some instances a small quantity of blood may also escape from the Fallopian tubes.

Character of the Flow.—At the beginning of menstruation the flow is composed of mucus streaked with blood, but when it becomes well established, it consists of pure blood mixed with mucus and epithelial cells from the uterine cavity and the vagina. As the flow begins to subside the blood lessens in quantity, and eventually the discharge becomes mucus in character again.

The flow is dark in color, like venous blood; it is alkaline in reaction and does not coagulate, owing to the presence of mucus, unless the discharge becomes excessive in amount. The color of the menstrual flow is altered in disease, and in chlorotic women it becomes almost watery in consistency and very light in color.

Recurrence, Duration, and Quantity of the Flow.—Every woman is a law unto herself, and consequently, while there is a general average by which we estimate the characteristics of the menstrual function, yet it must be borne in mind that there can be wide differences without a pathologic condition being present. The true test, after all, is the health of the individual, and it makes no difference whatever how near to or how far away

from the general average a woman's menstrual record may be, provided she remains perfectly well.

The menstrual flow recurs, on an average, every twenty-eight days, or thirteen times each year. The frequency, however, may be shortened or lengthened and yet perfect health be maintained. Thus, some women menstruate every two weeks, and others, again, only two or three times a year. Cases are on record of women menstruating only in warm weather, and it is not a rare occurrence to meet perfectly healthy women who are extremely irregular, often going for months without the slightest show. It is also not uncommon for women who are in the habit of menstruating every twenty-eight days to have the flow occur every three weeks for an indefinite period and then return to their normal time. In fact, it is the exception rather than the rule for an individual to menstruate regularly, and if a woman will keep a careful record for a year or more she will be very likely to find a difference in the dates of the recurrence of the flow.

During the first year of menstrual life the recurrence of the flow is often very irregular, and it is not uncommon for it to be absent for several months after its first appearance or to recur three or four times at varying intervals before it becomes fully established.

The menstrual flow usually lasts from three to six days. In some cases, however, the duration may be less, and in others it may be lengthened without the woman suffering any inconvenience. As a rule, the flow continues longer in plethoric women than in individuals who are not robust, and it is not uncommon for the former to menstruate eight or ten days each month without feeling any bad effects.

The quantity of blood lost at each period varies, on an average, from four to six or eight ounces, although the amount may be less or even more in women who are perfectly well.

Length of Menstrual Life.—The average length of menstrual life is from thirty to thirty-five years. Its duration is influenced, however, by physiologic and pathologic causes. A woman who menstruates early, as a rule, continues to do so longer than one who reaches puberty later in life. Various forms of pelvic disease, such as uterine tumors and tubo-ovarian inflammation, prolong the duration of menstrual life and delay the appearance of the menopause.

Management of Menstruating Women.—The care of women during the menstrual period is based upon common-sense principles and the general laws of hygiene. During the first twenty-four hours of the flow the pelvic organs are intensely congested, and it is therefore advisable for a woman to remain in her room in bed or lying on a sofa. Her duties subsequently should be as light as possible, and while the flow lasts, all forms of active exercise, such as long walks, riding, or cycling, should be forbidden. Cold bathing in any form should be avoided, as it tends to check the flow and bring about chronic congestive conditions of the pelvic organs. For the same reason exposure to the inclemencies of the weather and sitting in drafts should be carefully guarded against. The laws of cleanliness should be strictly enforced and the body kept clean and the skin active by a general sponge bath of tepid water and soap. The external organs should also be cleaned twice or thrice daily with tepid water and soap, as the discharges are apt to become rancid and offensive, especially in warm weather. The napkins should be changed frequently and not allowed to become over-saturated and foul. Vaginal injections should not

be employed while the flow continues unless ordered by a physician for therapeutic reasons. Sexual intercourse should also be avoided, as the congestion of the pelvic organs is increased by the act of copulation and it may result in chronic inflammation or the formation of a pelvic hematocele. The diet during menstruation should be simple and easily digested, and all varieties of spiced or highly seasoned foods should be interdicted. Alcoholic stimulants are also injurious, as they tend to prolong the flow and increase the pelvic congestion.

OVULATION.

Ovulation may be defined as the maturing and rupturing of a Graafian follicle with the subsequent escape of an ovum.

But little is practically known of the relation existing between ovulation and menstruation, and as to whether ovulation is periodic in its occurrence or whether it is a continuous process; and, finally, if it does occur periodically, whether it is synchronous with the menstrual flow. The final solution of these questions has not been accomplished up to the present time, and as it would be a useless task to discuss the various theories and views held by the profession, I shall simply give the following facts, which have been recorded from time to time and which prove that ovulation may occur independent of menstruation.

1. Conception has occurred during lactation and even after the change of life.

2. Young girls have been known to conceive before the appearance of the menses.

3. In rare instances women menstruate only during pregnancy.

4. While just before and immediately after menstruation are the most likely periods for sexual intercourse to be followed by impregnation, yet it is a well-known fact that it may take place at any time during the month.

MENOPAUSE.

Definition.—The menopause is that epoch in the life of the human female when she ceases to menstruate and bear children.

Synonyms.—The menopause is sometimes called the change of life, the dodging point, the critical period, and the climacteric.

Time of Appearance.—In the majority of instances the menopause occurs between forty-five and fifty years of age. Cases have been recorded, however, in which menstruation ceased as early as the twenty-second year, and also when it continued until over eighty years of age.

As a rule, early puberty is followed by a late menopause, and late puberty by an early cessation of the menstrual flow. The appearance of the menopause is also influenced by hereditary conditions, and the daughter is apt to reach the change of life at the same age as her mother. The climacteric occurs earlier in cold climates than in tropical or temperate zones, and in poor women than in the rich and indolent classes. It also appears earlier in fat and weak women than in individuals who are lean and strong, and in nulliparæ than in women who have borne children. Early maternity and rapidly succeeding pregnancies, as a rule, shorten the period of sexual life and bring about an early appearance of the menopause. The change of life is often indefinitely delayed by tubo-ovarian inflammatory conditions and uterine or pelvic neoplasms, and it is not uncommon under these circumstances for the flow to continue long after the normal period of the climac-

teric. And, finally, the menopause may occur abruptly at an early age from a severe attack of typhoid fever, cholera, or malaria, and also as the result of psychic influences, such as grief, sudden fear, or melancholia.

Duration.—The climacteric, like puberty, comes on gradually, and continues, as a rule, from two and a half to three years or even longer. In rare cases, however, it may be brief and sudden, menstruation continuing regularly up to a certain date, when it stops and never returns.

Physical Changes.—During the menopause senile changes take place which are atrophic in character and eventually result in a complete alteration in the physical appearance of the sexual organs. The vulva becomes flattened and shriveled from the loss of subcutaneous fat, and the hair on the labia and mons veneris becomes thin and eventually turns gray. The vagina atrophies and its walls become thin, less muscular, and flabby, and the dimensions of the canal are lessened. The uterus also undergoes general atrophy and becomes smaller in size, and the glands are diminished in number. The intravaginal cervix gradually becomes absorbed, and in time nothing remains but a small, knob-like body. The changes which take place in the Fallopian tubes and the ovaries are also well marked, and these organs eventually become so shriveled and contracted that they may disappear altogether. The breasts gradually become flattened and flabby unless a local deposition of fat occurs, and thick, short hairs not infrequently appear on the upper lip and the chin. The general contour of the body changes and the individual becomes stout and matronly looking, or she may lose flesh and become thinner than before the cessation of the menstrual flow. And, finally, the abdomen may become enlarged and pendulous from the accumulation of fat in the belly walls, the omentum, and the mesentery.

Symptoms.—The normal menopause is attended with few local and general disturbances, and, apart from the gradual or abrupt cessation of the menstrual flow and occasional flushes of heat and chilliness, with perhaps some psychic phenomena, there are no symptoms to mark the changes that are taking place in the sexual life of the woman. Unfortunately, however, a large number of women suffer more or less severely during the menopause with a variety of symptoms which are referred to the circulatory, nervous, and digestive systems, as well as to the pelvic organs themselves, and it is necessary, therefore, that a description of these phenomena—which are not, generally speaking, pathologic in character—be given in order that they may be recognized and their significance appreciated.

Cessation of Menstruation.—The first symptom of the change of life is the gradual or abrupt cessation of the menstrual flow. In most cases the process is gradual, and instead of menstruation occurring at the regular time, it will be delayed for a few days or months, and then recur as usual, to be followed by continued irregularities in regard to periodicity and quantity, until finally it ceases permanently. The advent of the menopause is seldom marked by the abrupt cessation of the menstrual flow, and it is a rare occurrence to meet cases in which women hitherto perfectly regular have suddenly ceased to menstruate.

Circulatory Disturbances.—The most frequent symptom of the menopause is the vasomotor disturbances, which manifest themselves by sudden sensations of heat over the face, the neck, or the entire body, followed by more or less profuse sweating and a feeling of chilliness. These symptoms occur at varying intervals, and in some cases they are extremely annoying and very frequent. Among other circulatory symptoms which are less constant may be mentioned a sensation of fullness in the head, indistinct vision, headache, sleeplessness, ver-

tigo, faintness, cold hands and feet, buzzing noise in the ears, epistaxis, bleeding from hemorrhoids, vicarious hemorrhages, and palpitation of the heart.

Nervous Disturbances.—These are irritable temper, hysteria, neuralgia in various parts of the body, general and local pruritus, burning sensations, feeling of numbness and tingling in the lower extremities, nervous depression, fear and anxiety, loss of memory, melancholia, and even insanity. The sexual appetite is often increased at the time of the menopause, and, curiously enough, some women hitherto without marked desire suddenly develop a passionate nature.

Digestive Disturbances.—The digestive functions are frequently deranged, and some of the most annoying symptoms that present themselves during the climacteric are due to disorders of the alimentary canal. Dyspepsia is common during the change of life, as well as some torpidity of the liver, and intestinal flatus is not infrequently a disturbing element in these cases. Constipation or diarrhea is often present, and many of these women are annoyed by the appearance of acne upon the skin of the face and chest.

Local Disturbances.—The local disturbances are due to pelvic congestion which occurs from time to time, and which is not relieved, as usual, by the periodic discharge of blood. These phenomena are chiefly manifested by backache, slight pain in the inguinal regions, irritable bladder, and a sensation of weight or fullness in the pelvis.

Abnormal Symptoms.—Menorrhagia and metrorrhagia are never caused by the menopause, and when profuse menstruation or irregular hemorrhages occur, they must not be attributed to the change of life. The same is true of irregular bleedings which take place after the climacteric has been established, and of hemorrhages which sometimes occur long after menstruation has ceased. These phenomena always denote some pathologic condition, and a physical examination must be insisted upon, which will usually reveal the presence of cancer, a uterine neoplasm, inversion of the uterus, or a benign fungoid growth of the endometrium.

As a rule, all benign lesions disappear during the period of the menopause, and therefore uterine discharges that are dependent upon chronic endometritis gradually lessen in amount or spontaneously cease altogether. If, however, a previously existing leukorrhea increases in amount, or a vaginal discharge appears for the first time during the menopause, a physical examination is imperatively demanded, as it may be the forerunner of a malignant disease.

The mental state of the patient should be carefully watched during the climacteric, as melancholia and other forms of insanity may develop at this period in women with a hereditary taint or in individuals of a pronounced neurotic temperament.

Diagnosis.—The diagnosis of the menopause when it occurs at the usual time offers no difficulties whatever, but occasionally when it appears prematurely it is often a question as to whether the cessation of menstruation indicates the change of life or whether it is a temporary condition dependent upon a pathologic cause. The solution of the problem must be based upon a careful and thorough general examination, as well as a study of the patient's history, in order, if possible, to determine a cause for the amenorrhea. This examination must consist of a systematic investigation of each organ in the body, as well as the blood, the urine, and, if indicated, the sputum, because only in this way can those organic

diseases be excluded which have an inhibitory influence upon the function of menstruation. If after such an examination no cause is found for the disappearance of the menstrual flow, and the clinical history of the patient presents no evidence to the contrary, we may reasonably conclude that a premature menopause has occurred. On the other hand, however, if the examination of the blood shows an anemia, or if the lungs are tubercular, or if the patient is syphilitic, the amenorrhea is evidently pathologic in character and due to a definite cause, which may or may not be amenable to treatment.

Prognosis.—The prognosis of the normal menopause is always good. Benign diseases of the pelvic organs show a tendency to undergo spontaneous cure during this period; on the other hand, however, malignant diseases often manifest themselves for the first time at the menopause, and women in whom a hereditary taint of insanity is present may become insane.

Treatment.—The management of the change of life may be conveniently discussed under (*a*) the routine and (*b*) the special treatment.

Routine Treatment.—This consists in keeping the patient's health in the best possible condition by careful attention to the laws of hygiene, and investigating at once any unfavorable symptoms which may develop.

The bowels should be opened daily and any tendency to constipation should be corrected by a mild laxative. The occasional use of a saline is especially beneficial, as it lessens the pelvic congestion, which is the cause of many of the local symptoms of the menopause. The action of the kidneys should be carefully watched and the urine examined from time to time. The patient should keep the kidneys well flushed by drinking three or four pints of water daily, and any tendency to lithemia should be relieved by the administration of lithia, citrate of potassium, and other anti-uric acid remedies.

The diet should be simple and nutritious, and all spiced and highly seasoned foods should be forbidden. Tea and coffee should be used sparingly and alcoholic stimulants should be avoided altogether unless they are especially indicated.

Exercise in the open air is especially beneficial during the climacteric, as it lessens the pelvic congestion and equalizes the general circulation. The same is true of indoor exercise (see p. 117), which should be taken every morning immediately after getting out of bed, and also for a few minutes before retiring at night. A cold sponge, spray, or plunge bath should be taken every morning before breakfast, and twice a week the patient should be given a full hot bath or a Turkish bath just before retiring at night. The action of the cold baths is stimulating to the vasomotor centers and relieves the flushes which are at times so annoying. The sedative action of the hot-water or hot-air bath is also marked and assists materially in lessening the nervous tension and mental irritability.

A thorough local examination should be made at the beginning of the menopause, and if a laceration of the perineum or the cervix exists, it should be repaired at once to guard against the development of a senile prolapse of the pelvic organs or the possibility of cervical cancer.

Special Treatment.—The special indications in the treatment of the menopause are frequently dependent upon conditions which are not connected with the pelvic organs, but which involve the circulatory, nervous, and digestive systems, and hence they must be treated upon general medical principles. On the other hand, however, there are certain phenomena which are distinctly due to

the climacteric, and therefore their management and treatment require a brief special consideration.

The vasomotor disturbances, which are at times very marked and annoying, are usually relieved by cold bathing and the administration of sodium bromid in 20-grain doses three or four times daily. Picrotoxin (gr. $\frac{1}{100}$ to $\frac{1}{80}$, three times a day) is also a useful remedy, and frequently controls the flushes which attend the menopause. If the flushes are associated with headache, good results are obtained with fluid extract of gelsemium in 2- or 3-drop doses every three hours and the administration of a drachm of phosphate of sodium every morning before breakfast. The diet and exercise should be carefully regulated and the bowels opened daily, as any tendency to constipation increases the pelvic congestion and adds to the discomfort of the patient. The occasional use of salts in the treatment of the menopause should always be borne in mind, as nothing will relieve the local congestion and the vasomotor symptoms more quickly and thoroughly than Rochelle or Carlsbad salts, Hunyadi Janos water, phosphate of sodium, or a bottle of the citrate of magnesia.

The nervous symptoms are usually controlled by the administration of sodium bromid, valerian, or asafetida, and a full hot bath or a Turkish bath taken twice a week just before retiring for the night also has a beneficial effect. The cold sheet bath (p. 89), followed by general massage, is very useful in relieving the nervous depression and physical exhaustion which are sometimes present in these cases.

The local symptoms which are dependent upon congestion of the pelvic organs are controlled by hot-water vaginal douches, glycerin tampons, scarification of the cervix, and the occasional use of a saline purge.

CHAPTER XXXIII.

MENSTRUAL DISORDERS.

PRECOCIOUS MENSTRUATION.

Definition.—When menstruation occurs in a child prior to the age of puberty (thirteen years), it is called precocious.

Frequency.—While precocious menstruation is a rare occurrence, yet examples are not uncommon in which it has appeared very early in childhood, and cases have also been observed of periodic hemorrhages from the genital organs even in infancy.

Causes.—The causes, as a rule, are difficult to determine, although it has been traced in some cases to hereditary influences, and in others it has been found to be associated with a pathologic lesion, such as an adherent prepuce, a neoplasm, or an irritable condition of the vulva from uncleanliness, parasites, or masturbation. Again, vicious companions, reading lewd literature, and unhealthy forms of mental excitement are occasionally found to be the predisposing causes in some instances.

Results.—The appearance of precocious menstruation is usually attended by other evidences of puberty, and the genitalia develop, the breasts enlarge, and the sexual appetite sometimes becomes manifest. The occurrence of gestation in some of these individuals proves their capability for reproduction and es-

tablishes the fact that the changes which take place in the organs of generation are similar to those which occur during a normal puberty.

Diagnosis.—The diagnosis is based upon the occurrence of a periodic discharge of blood from the genital canal, which is usually associated with other evidences of puberty as described above.

Precocious menstruation must be carefully distinguished from other hemorrhages or bleedings which are in no way connected with the function of the menstrual flow, and which are not uncommonly observed in young children and infants. Sometimes the diaper of a new-born child may be stained with blood which is discharged from the rectum (*melena neonatorum*); or there may be slight irregular bleedings from granular patches on the vulva or about the external urinary meatus; and, finally, hemorrhages may take place from a sarcomatous growth. It is also not uncommon to observe a single discharge of a few drops of blood from the genital organs of infants and young children without any obvious cause whatever, and the red stains which are so often seen on the clothing are found in most instances to be a deposit of red urates.

Treatment.—The treatment is based upon the removal of the cause and the hygienic management of the patient.

The external organs should be thoroughly examined and all sources of local irritation removed by appropriate treatment. If the moral character of the child is at fault, she should be guarded against all injurious influences and carefully watched to prevent masturbation.

The character of the diet, the amount of exercise, and the hours devoted to sleep and study should be carefully regulated. The use of cold baths is often beneficial in these cases, and they may be given in the form of a sponge, a spray, or a plunge (see hydrotherapy, p. 77).

RETARDED OR DELAYED MENSTRUATION.

Definition.—If the menstrual flow does not appear before the individual is fifteen years of age, it is considered to be retarded or delayed.

It is not uncommon for healthy girls to begin their menstrual life later than the average time of puberty, and cases have been recorded in which the flow appeared for the first time at thirty-one years of age.

Causes.—Retarded menstruation may be due to hereditary influences or it may result from a congenital cause or tardy development of the internal organs of generation. The uterus or the ovaries or both may be absent or only partially developed, and in some cases there may be an atresia of the genital canal, which is usually found to be an imperforate hymen. Sometimes the appearance of the menstrual flow may be delayed on account of bad hygienic conditions, such as hard work, overstudy, poor or improper diet, and tainted air, or, again, it may be due to chlorosis, phthisis, congenital syphilis, and other constitutional diseases.

Symptoms.—Absence of the flow is the only manifestation observed in the majority of cases and the general health is usually not impaired. The other evidences of puberty are generally present and the girl gradually develops the physical and mental attributes of her sex. If the absence of menstruation is due to an atresia of the genital canal which prevents the escape of the flow, symptoms of the *menstrual molimen* occur each month, and consequently the cause may be suspected.

Diagnosis.—The diagnosis depends upon the recognition of the cause. A congenital defect or an atresia can generally be recognized by a physical examination; hereditary influences are ascertained by a careful inquiry into the men-

strual history of the family; and the presence of bad hygienic conditions and constitutional diseases is usually self-evident.

Prognosis.—The prognosis depends upon the cause. An atresia of the genital canal can usually be relieved by an operation; defects in the development of the uterus or the ovaries are generally permanent and cannot be remedied by treatment; bad hygienic conditions can be corrected in most cases; and constitutional diseases can often be benefited or cured.

Treatment.—The treatment is based upon the cause, and is fully discussed under Amenorrhea.

MENORRHAGIA AND METRORRHAGIA.

Description.—*Menorrhagia* is excessive loss of blood at the menstrual periods, and *metrorrhagia* is hemorrhage from the uterus independent of menstruation. The line separating these conditions is more theoretic than real, and as they are practically the same, they will be considered together. In some women the intermenstrual period is shortened, and consequently the amount of blood lost during the year is excessive.

Causes.—The causes are divided into:

1. *The local causes.*
   - Uterine in origin.
   - Ovarian and tubal in origin.
   - Pathologic conditions in the surrounding pelvis.
2. *The general causes.*
   - Acute and chronic diseases.
   - Reflex conditions.
   - Special causes.
3. *Unusual causes.*
   - Foreign substances in the uterine cavity.

Local Causes.—Uterine in Origin.—These are: (1) Displacements of the uterus; (2) pregnancy; (3) malignant diseases; (4) chronic uterine inflammations; (5) tumors; (6) diseases of the cervix; and (7) inversion of the uterus.

Displacements of the Uterus.—Uterine displacements by dragging upon the blood-vessels cause pelvic congestion which eventually results in endometritis. The congestion which normally takes place at the menstrual periods is consequently greatly increased and nature relieves herself by an excessive flow.

Pregnancy.—Certain conditions dependent upon pregnancy cause uterine hemorrhage, such as placenta prævia, separation of the placenta, and hydatidiform degeneration of the chorion. Incomplete abortions are also a frequent cause, on account of the irritation produced by the retained membranes or fetus. In rare instances pregnant women have a periodic flow of blood from the uterus at a time corresponding to the normal periods and menstruation continues regularly throughout gestation. These patients, as a rule, continue to full term.

Malignant Diseases.—Cancer, sarcoma, and chorio-epithelioma cause menorrhagia by bringing more blood to the uterus for their nourishment, by congestion resulting from irritation, and, finally, by rupture of the blood-vessels from the ulceration which ultimately takes place. The hemorrhage is very persistent, and at times it may be severe, causing rapid anemia. Tubercular ulcerations also cause metrorrhagia.

Chronic Uterine Inflammations.—Subinvolution of the uterus and endometritis are a cause of menorrhagia. In the former disease the uterus is increased in size and is more vascular, while in the latter the changes in the en-

dometrium act as an irritant and increase the pelvic congestion. This occurs more especially in those forms of chronic endometritis which are characterized by swelling and thickening of the mucous membrane—the so-called *hyperplastic endometritis*.

Tumors.—Uterine tumors cause menorrhagia by obstructing the venous circulation, by irritation, by increasing the demand for blood, and by hemorrhages from the growth itself. The situation and histologic character of a uterine fibroid determine the amount of hemorrhage, and the bleeding is most severe in a submucous growth. There is less hemorrhage from the interstitial variety, and a subperitoneal tumor has little or no effect upon the menstrual flow unless it is situated partly within the parenchyma of the uterus or is large enough to obstruct the venous circulation by pressure. Some of the most persistent hemorrhages are caused by mucous and fibroid polypi, and a uterine myoma is generally associated with excessive bleeding.

Diseases of the Cervix.—Lacerations and cystic degenerations of the cervix are frequently the cause of an increase in the amount of the menstrual flow, and the vaginal discharges may be stained at times by bleeding from a granular or eroded surface. This is especially liable to occur from contact with the penis during sexual intercourse and friction against the vagina in walking. Hypertrophy and tumors of the cervix are also a cause of menorrhagia. Malignant diseases have already been referred to.

Inversion of the Uterus.—The chronic forms of inversion of the uterus cause persistent and, at times, severe hemorrhage.

Ovarian and Tubal in Origin.—Inflammatory diseases and neoplasms of the uterine appendages give rise to menorrhagia by causing congestion. In some cases an ovarian tumor which becomes incarcerated in the pelvis will obstruct the circulation and increase the normal menstrual flow.

Pathologic Conditions in the Surrounding Pelvis.—Fecal impaction, tumors of the pelvis, the rectum, or the bladder, and diseases of the broad ligaments, such as varicocele, hematoma, solid tumors, and cysts, cause menorrhagia by increasing the blood-supply and obstructing the return circulation.

General Causes.—Acute and Chronic Diseases.—There is a class of diseases which cause menorrhagia chiefly on account of the changes which they produce in the blood. These affections are: hemophilia, scurvy, purpura, many forms of anemia, malaria, syphilis, incipient phthisis, acute infectious fevers, septic infections, chlorosis, and general debility. Some of these diseases, such as anemia, chlorosis, debility, etc., as a rule, cause amenorrhea, but not infrequently we find them associated with menorrhagia. In another class of cases menorrhagia may be due to affections which cause an obstruction to the return of venous blood; and thus, for example, it is not uncommon for excessive menstruation to be associated with cardiac diseases, especially mitral insufficiency and stenosis, emphysema, diseases of the liver, kidneys, or spleen, and abdominal tumors.

Reflex Conditions.—Menorrhagia may be dependent upon psychic conditions, and under these circumstances it is reflex and not due to pelvic disease. The chief causes are: hysteria; various emotions, as fright, sorrow, or fear; mental impressions produced by the first sexual intercourse; and the reflexes incident to puberty, the menopause, and lactation.

Special Causes.—The habits of a woman may be the cause of menorrhagia. A sedentary mode of life, as a rule, predisposes to amenorrhea, but occasionally it results in excessive menstruation. High living, especially the use of alcoholic stimulants and rich foods, may be a cause. A change of residence

from a low to a high altitude or from a temperate to a tropical country may affect the menstrual function and temporarily cause menorrhagia. Certain chemic poisons, such as lead and phosphorus, increase the menstrual flow.

Unusual Causes.—Foreign Substances in the Uterine Cavity.—Foreign substances may be left in the uterine cavity at the time of an operation and eventually, if they are not expelled, become the cause of menorrhagia. Gauze and tents are the articles most likely to be found under these circumstances, and neglected pessaries have been known to work their way into the cavity of the uterus, producing an offensive discharge and hemorrhage.

Symptoms.—Uterine hemorrhage and the excessive loss of blood at the menstrual periods are the characteristic symptoms of metrorrhagia and menorrhagia. The bleeding may be only slight in amount but persistent, and in some cases a severe hemorrhage may come on suddenly. The duration of the menstrual flow may be increased or the amount may be excessive, and sometimes the intermenstrual period may be shortened.

The constitutional symptoms of menorrhagia depend upon the cause and the amount of blood lost; some patients become profoundly anemic.

Diagnosis.—Abnormal bleeding from the uterus is a symptom, not a disease, and the diagnosis is the recognition of its cause. Hemorrhage during the intermenstrual period is always pathologic, but it is sometimes a question as to whether or not the menstrual flow is in excess. To determine what is excess, the original *type* must be ascertained and compared with existing conditions. In other words, How does the present periodicity, duration, and quantity of the flow compare with the same menstrual characteristics after the function of menstruation had been fully established at puberty? We must, however, bear in mind that there may be differences existing between the original type and present conditions without any apparent effect upon the health. This fact, therefore, must be considered when the question of excess arises.

During puberty while the menstrual function is being established irregularities in the phenomena of menstruation frequently occur. Excessive menstruation under these circumstances has a significance far different from the same symptom later on in life; the former, as a rule, is not pathologic, while the latter is nearly always so.

The importance of a correct diagnosis of the origin of uterine hemorrhages cannot be overestimated, and this is especially true of menorrhagia or metrorrhagia occurring during or near the menopause. The mistake is too frequently made of ascribing these symptoms to the "change of life," and valuable time is lost before a physical examination reveals the true condition. Every woman should be most carefully watched during the menopause and the cause found for every symptom which may occur. The same is true of uterine hemorrhage occurring at other periods in a woman's life, as malignant disease may appear early, and unless recognized at once, it may pass beyond the reach of surgery.

In unmarried girls after puberty and up to the age of twenty-five years excessive menstruation is usually due to general causes; in unmarried women up to forty, to fibroid tumors of the uterus; in married women who have borne children, to such local causes as uterine displacements, chronic inflammations of the uterus, fibroids, and polypi; and in women at or near the menopause, to cancer of the cervix.

Hemorrhage from other parts of the genital tract must not be mistaken for menorrhagia or metrorrhagia. For example, a hemorrhage may be due to rup-

ture of varicose veins of the vulva, to specific ulcerations of the external organs of generation or vagina, and to various injuries. Hemorrhage may also occur from rupture of the hymen during the first sexual intercourse, and blood in the urine from hematuria or hemoglobinuria has been mistaken for uterine bleeding.

It is impossible in some cases of menorrhagia and metrorrhagia to discover the cause. This does not mean, however, that they are idiopathic, but simply that the cause cannot be located and its nature determined.

Prognosis.—The prognosis depends upon the nature of the cause. In some cases it is easily found and removed; in other instances it is uncertain or obscure; and, finally, the cause itself may tend toward a fatal ending.

Menorrhagia and metrorrhagia are seldom directly fatal. The constant loss of blood, however, results in anemia, destroys the patient's health, and renders her liable to death from a trifling intercurrent disease.

Treatment.—The treatment of menorrhagia and metrorrhagia is considered under two headings:

The treatment or removal of the cause.

The treatment of the hemorrhage independent of the cause.

The Treatment or Removal of the Cause.—After the cause has been determined our attention is at once directed toward its treatment or removal.

The Local Causes.—The treatment of the various local causes of uterine hemorrhage is discussed in their respective chapters and need not therefore be referred to here.

The General Causes.—It is obviously impossible to discuss the treatment of many of the general causes in a treatise upon gynecology, and if, for example, the uterine hemorrhage is dependent upon a disease of the liver, the kidneys, the heart, or the spleen, the management of the case must be based upon the principles laid down in works on the practice of medicine.

The management of uterine hemorrhage dependent upon psychic conditions requires special mention. If the cause is due to lactation, the child must be weaned; or if the hemorrhage occurs in a newly married woman, sexual intercourse must be forbidden and the husband and wife should occupy separate beds. Menorrhagia due to various emotions, as fright, sorrow, or fear, seldom continues for any great length of time, and is treated by the use of sedative drugs. Hysteric women are usually neurasthenic, and if the case is a pronounced one, the "rest-cure" is usually followed by good results. Reflex irregularities occurring during the menopause and puberty are treated with sedatives.

The treatment of the special causes is simply the correction of those habits or conditions upon which the menorrhagia depends. Thus, if a sedentary mode of life is the cause, the patient must be instructed to take systematic exercise, high living must be corrected, and the use of alcoholic drinks and rich foods forbidden.

Menstrual irregularities due to a change of residence are seldom permanent and yield readily to sedatives.

The Unusual Causes.—The treatment of the unusual causes of uterine hemorrhage consists in the removal of the foreign substance from the cavity of the uterus and curetment of the endometrium, which is generally infected in these cases.

The Treatment of the Hemorrhage Independent of the Cause.—In all cases of menorrhagia and metrorrhagia a routine plan of treatment must be instituted whether the cause is determined or not.

The routine treatment is considered under the following headings: (1) Rest; (2) diet; (3) care of the bowels; (4) local treatment; (5) drugs.

Rest.—The patient is placed in the recumbent position and the foot of the bed raised about ten inches. The bed-pan must be used and the patient not

allowed to get out of bed for any purpose. Mental rest is also important and no unnecessary excitement should be permitted. Visitors must be excluded from the sick-room and the patient should not be allowed to be worried about her household duties.

In cases of excessive menstruation the rest treatment must be carried out during each menstrual period and the patient not allowed to get out of bed for at least twenty-four hours after the flow has ceased. If the menorrhagia is slight, it is not necessary for the patient to have absolute rest, but she must keep in her room during the period and lie down frequently. In cases of uterine hemorrhage occurring during the intermenstrual period absolute rest is indicated, and it must be continued so long as the flow lasts.

Sexual rest is imperative, and not only must coitus be forbidden, but the husband and wife must occupy separate beds.

Diet.—The diet must be carefully regulated. The food should be simple, easily digested, and not stimulating, and red meats and vegetables which predispose to a uric acid diathesis avoided. Alcoholic stimulants and coffee are not allowed and the patient should be instructed to drink plenty of pure water.

The Care of the Bowels.—It is important to keep the bowels regular, as constipation causes pelvic congestion and increases the amount of bleeding. The intestinal canal should be flushed with a bottle of citrate of magnesia and the bowels kept regular with a laxative pill and rectal enemas. The occasional use of a saline purgative is followed by good results, and it should be employed once or twice a week as a routine measure.

The Local Treatment.—The local treatment depends upon the nature of the case, and is considered as follows: (1) Hot water vaginal douches; (2) vaginal tampons; (3) applications of cold; (4) saline injections; (5) dilatation and curetment of the uterus; and (6) uterine tampons.

Hot Water Vaginal Douches.—Vaginal injections of hot water or normal salt solution are one of the best means we possess for controlling uterine hemorrhage and excessive menstruation.

The injections must be given three times a day, and the quantity of water required in each douche depends upon the severity of the bleeding. In mild cases from a gallon to a gallon and a half are sufficient, and when the bleeding is excessive at least double this quantity should be employed. The injections are continued during the intermenstrual period and stopped when menstruation begins. No harm will result in using them during menstruation if the flow is excessive or prolonged, and under these circumstances they should be employed to control the bleeding and lessen the loss of blood.

Vaginal Tampons.—A vaginal tampon is the most certain means we possess to control hemorrhage from the non-gravid uterus, and it should be employed between the periods to check the bleeding while an effort is being made to remove the cause of the local condition. It is also a valuable remedy in cases of uterine hemorrhage in which no cause can be determined, and its use under these circumstances often stops the bleeding for an indefinite length of time.

In cases of excessive menstruation in which a long time is required for the treatment or the cause cannot be discovered and the loss of blood is injurious to the patient's general health, nothing gives such good results as a vaginal tampon. It should be used for several months at each menstrual period, either when the flow begins or after it has continued for two or three days. If the flow is excessive from the start, the tampon must be introduced at once; but if the loss of blood is due to the duration of the period being prolonged, it is better to wait for two or three days before packing the vagina. The use of a vaginal tampon

under these circumstances stops the excessive loss of blood, improves the general health, and the patient responds better to treatment.

Applications of Cold.—Cold is applied by means of ice-bags, which are placed over the lower abdomen and the lumbosacral region. The application of cold is not, however, often advisable in the treatment of uterine hemorrhage and excessive menstruation, because patients who are suffering from loss of blood require the stimulating effect of heat, which also produces a quicker and more permanent contraction of the blood-vessels.

Saline Injections.—The injection of normal salt solution into a vein (*intravenous*), into the subcutaneous tissues (*hypodermoclysis*), or into the rectum (*enteroclysis*) is a valuable adjunct in the treatment of severe or sudden uterine hemorrhage and exhaustion dependent upon the continuous loss of blood.

Dilatation and Curetment of the Uterine Cavity.—Dilatation and curetment of the uterus are indicated as a routine treatment, especially when the cause is local in origin and changes have taken place in the endometrium. These changes often keep up a hemorrhage even after the original cause has been removed, and if the symptom is due to a uterine polyp or a gross pelvic lesion, dilatation and curetment of the uterine cavity must follow the primary operation. Again, as an empiric plan of treatment in cases in which no cause can be discovered, curetment of the uterus and the application of pure carbolic acid to the uterine cavity have been followed by permanent results.

Uterine Tampon.—The uterine tampon controls bleeding and is indicated in the treatment of menorrhagia and metrorrhagia after the removal of large uterine polypi, submucous tumors, incomplete abortions, and after an operation which leaves the walls of the uterus relaxed or its cavity enlarged. Under these circumstances the tampon checks bleeding and stimulates uterine contractions. It must be removed in twenty-four hours and not reintroduced unless the indication is imperative. The reintroduction of a uterine tampon must be attended with the strictest antiseptic precautions, and its use therefore cannot be recommended as an empiric plan of treatment for excessive loss of blood in cases of menorrhagia and metrorrhagia, for the reason that a vaginal tampon meets all the indications without the danger of causing septic infection.

Drugs.—The following remedies are recommended in the treatment of uterine hemorrhage:

Ergot.—This drug is indicated when menorrhagia or metrorrhagia is uterine in origin. It is therefore especially useful in subinvolution, interstitial fibroids, and many forms of active and passive congestion. If the cause of the bleeding is extrauterine, it has but little effect, and practically no results follow its use in pathologic conditions which are limited to the endometrium. Ergot may be given alone or in combination with other drugs, and, on account of its depressing effect upon the heart, especially when given for an indefinite length of time, it should always be combined with sulphate of strychnin. The fluid extract of ergot and ergotin are the best preparations to employ, and they should be administered by the mouth and not by hypodermic injections.

Hydrastis.—Hydrastis, through its effect on the vasomotor nerves, stimulates uterine action, and is therefore a valuable remedy in cases of menorrhagia and metrorrhagia due to subinvolution, interstitial fibroids, and chronic uterine congestion. It is especially useful in cases of hemorrhagic endometritis, and is also indicated in uterine bleeding occurring during pregnancy, on account of not interfering with the normal course of gestation. Hydrastinin and the fluid extract are the best preparations to employ, and they combine well with ergot. Hydrastis is usually given during the intermenstrual periods, and in cases in which the flow is excessive it may be continued during menstruation.

The following is an excellent combination for the administration of hydrastis:

℞. Hydrastininæ hydrochloratis, ... gr. x
Ergotini, ... gr. xl
Strychninæ sulphatis, ... gr. ss
M. et ft. pil. no. xx.
Sig.—One pill three times a day.

If the fluid extract of hydrastis is employed, it should be given in full doses and combined with the fluid extract of ergot.

Viburnum prunifolium.—This remedy is indicated in menorrhagia and metrorrhagia due to reflex conditions incident to puberty, the menopause, and lactation, and is also of great service when the cause is due to acute and chronic diseases. For example, it has been employed with good results in excessive menstruation occurring during the course of acute infectious fevers, and in cases of anemia, malaria, and chlorosis the remedy has proved of value in controlling menorrhagia. It is also useful in menorrhagia associated with dysmenorrhea, and is invaluable in the treatment of uterine hemorrhages occurring during pregnancy.

The fluid extract of viburnum is the best preparation to employ, and it should always be given in full doses.

Hamamelis.—Witch-hazel is indicated in passive uterine congestion when the hemorrhage is small in amount and persistent and the blood dark in color. It is therefore a valuable remedy in menorrhagia due to retrodisplacements of the uterus, subinvolution, and hyperplastic endometritis, and has also been used with success in uterine hemorrhage caused by purpura and allied conditions. The fluid extract is the best preparation to employ, and it may be given alone or in combination with the fluid extract of ergot.

Iron.—The indications for the use of iron in the treatment of menorrhagia and metrorrhagia must be carefully considered, as its indiscriminate administration will often result in increasing rather than diminishing the excessive flow or hemorrhage. The preparations of iron are chiefly employed for their effect upon hematosis, and are therefore especially valuable in the treatment of menorrhagia and metrorrhagia due to acute and chronic diseases which produce changes in the blood. Thus, they are indicated in hydremia, anemia, chlorosis, hemophilia, and allied diseases, and in cases of debility arising from excessive lactation, indigestion, general exhaustion, etc., the remedy is invaluable. Iron should be given only during the intermenstrual period and discontinued when the flow appears. On the other hand, however, there may be exceptions to this rule, and it will be found advisable not to discontinue its use during the flow.

Less Important Drugs.—Other remedies which are of value as uterine hemostatics are the mineral acids, especially dilute sulphuric; alum; gallic acid; cotton root, and chlorid and carbonate of calcium. Digitalis is valuable in the treatment of uterine hemorrhage occurring during pregnancy, and the bromids, opium, and cannabis indica, on account of their sedative action, are of service in cases due to reflex causes.

AMENORRHEA.

Description.—Amenorrhea is the absence of menstruation. Under this definition are included acute suppression of the menses from cold, scanty menstruation, and the concealed form due to atresia.

Causes.—The causes of amenorrhea are classified as follows into:

Physiologic causes.
Congenital causes.
Acquired causes.

Physiologic Causes.—Amenorrhea is normal when it occurs during certain periods and conditions of a woman's life. Thus, menstruation is absent before puberty and during senility; it is irregular in its periodicity during puberty and the menopause; and, as a rule, it is absent during pregnancy and lactation.

Congenital Causes.—These are subdivided into (1) congenital obstructions, and (2) imperfect development, or absence of the organs of generation.

Congenital Obstructions.—Congenital atresia may be a cause of amenorrhea, and although menstruation takes place regularly in these cases the flow is concealed and unable to pass beyond the obstruction. The menstrual blood accumulates and the amount is increased at each monthly period. The vagina eventually becomes filled with menstrual blood (*hematocolpos*); then the uterus (*hematometra*); and finally the oviducts (*hematosalpinx*). The atresia may be situated in the cervical canal, the vagina, or the vulvovaginal orifice; the latter situation is the most common, and the obstruction is usually due to an imperforate hymen.

Imperfect Development or Absence of the Organs of Generation.—Nothing is known of the cause of these abnormal conditions, and menstruation does not occur because nature has failed to provide the necessary organs for the purpose. Imperfect development or absence of the sexual organs is a rare condition. Cases have been met in which no sexual changes occurred at the time of puberty and the breasts were not enlarged, hair did not appear on the mons veneris, and the external organs, the vagina, the uterus, and the ovaries retained their infantile characteristics. Again, amenorrhea is present in another class of women, known as the "*masculine type*," in which the organs of generation are apparently well developed and yet fail to perform their functions. These women are usually trained from early childhood to be professional athletes, and their muscular system has been overdeveloped at the expense of their sexual apparatus.

Acquired Causes.—These are subdivided into (1) the local and (2) the general.

The vast majority of cases of amenorrhea are due to acquired conditions, and of these the general causes are the most important.

Local Causes.—*Vagina.*—Amenorrhea may be due to atresia of the vagina caused by traumatism, labor, inflammation, ulceration, or operative procedures, and under these circumstances the menstrual flow is concealed, as in the congenital forms of obstruction.

Uterus.—Amenorrhea may be caused by atresia resulting from operations upon the cervix and the application of the actual cautery or acids to the cervical canal. It may also be due to the sclerotic stage of chronic hyperplasia, and to atrophy or superinvolution of the uterus, dependent upon frequently succeeding pregnancies or prolonged lactation.

Uterine Appendages.—It is extremely rare for any form of acute or chronic disease of the uterine appendages to cause amenorrhea. The tendency in these cases is to cause menorrhagia rather than a lessening of the menstrual flow, and although a large ovarian cyst may cause amenorrhea, the condition is not due to the tumor itself, but to the debility and exhaustion which accompany it. In rare instances acquired atrophy of the ovaries may cause amenorrhea, and the cessation of menstruation may therefore follow as a sequela such acute febrile diseases as measles, smallpox, scarlet and typhoid fevers.

Operative Removal of the Uterus and its Appendages.—Amenorrhea results from the removal of the uterus or its appendages. After the ovaries and oviducts have been removed menstruation ceases, although exceptions to this rule are met from time to time, and women have continued to menstruate regularly for an in-

definite period. These exceptions may be due to a supplementary ovary; to an incomplete removal of ovarian tissues or the oviducts at the time of the operation; to a diseased condition of the uterus or endometrium acting as a local irritant; and, finally, to the law of habit. After a hysterectomy menstruation ceases, unless the appendages have not been removed, in which case the flow may return and be discharged by the vagina, or it may become vicarious. Later on, however, the ovaries usually atrophy and the function becomes extinct.

The phenomenon of menstruation continuing after the removal of the pelvic organs is illustrated by the following case, which occurred in my practice. Both ovaries and tubes were removed in 1895 by a Philadelphia gynecologist, and after the operation menstruation became more frequent, occurring every two weeks. In 1896, one year later, I performed a supravaginal hysterectomy, and found the ovaries and tubes absent and the stumps close to the uterus. Menstruation ceased for two months after the hysterectomy, when it returned, and then appeared regularly every four or five weeks up to September, 1899, nearly three and a half years after the body of the uterus had been removed, when I lost sight of the patient.

General Causes.—*Exhausted State of the System.*—This is the most frequent and important cause of amenorrhea. The absence of menstruation is due to the fact that nature cannot afford to expend the necessary amount of blood and nerve force required to carry on the function, and amenorrhea results, not from any local pelvic disorder, but because the woman's system is unequal to the demands made upon it.

Acute Diseases.—Acute diseases are the cause of a temporary absence of menstruation on account of the debility which accompanies them, and thus amenorrhea may occur as a sequela to typhoid fever, diphtheria, scarlet fever, pneumonia, rheumatic fever, and allied disorders. Menstruation is absent in these cases, as a rule, for several months, and returns again when the patient has been fully restored to health. In exceptional instances, however, atrophy of the uterus or its adnexa results as a sequela and the amenorrhea is permanent.

Chronic Diseases.—Chronic affections which debilitate and exhaust the system often cause amenorrhea, and hence the affection may result from tuberculosis, especially pulmonary; chlorosis; anemia; malaria; neurasthenia; syphilis; myxedema; exophthalmic goiter; organic diseases of the abdominal and thoracic viscera; malignant diseases; etc. Amenorrhea due to chronic diseases may or may not be permanent, according to the nature and curability of the affection which causes it. If the disease is curable or there is even a temporary improvement in the patient's condition, menstruation returns as an evidence of increasing strength.

Bad Hygienic Conditions and Surroundings.—These conditions are responsible for the largest number of cases of amenorrhea, and indolent habits and want of exercise in the open air frequently result in scanty or absent menstruation. The excessive use of alcoholic stimulants affects the function of menstruation, and although, as a rule, alcohol increases the flow, yet eventually organic diseases may result which will debilitate the system and cause amenorrhea. The drug-habit continued for an indefinite period sooner or later interferes with menstruation, and amenorrhea is often observed as one of the most frequent symptoms present in morphinism. Workers in certain chemicals, such as lead, mercury, etc., frequently suffer from chronic poisoning which results in cachexia and interference with the normal menstrual flow; the same

is true when these chemicals are taken internally, by design or as the result of an accident. Brain work, especially if exercise is neglected, interferes with the functions of nutrition and reproduction, and literary women and those whose duties require them to live a sedentary life are likely to suffer from amenorrhea. Young girls who overstudy and are confined for a long time each day in the class-room are seldom normal, and the flow is scanty or absent. The most frequent causes of amenorrhea in the poorer classes are overwork, insufficient food, bad general hygiene, and impure air.

Acute Secondary Anemia.—Anemia may cause a temporary absence of the menstrual flow, and amenorrhea frequently follows a hemorrhage in typhoid fever, pulmonary tuberculosis, ulcer of the stomach, and operative procedures.

Obesity.—Women who are obese and who rapidly accumulate fat are apt to have amenorrhea, scanty menstruation, and lengthening of the intermenstrual periods, and it is not uncommon for obesity to be associated with sterility. The menstrual irregularities in these cases are due to the accompanying anemia and the weakened condition of the nervous and circulatory energy of the pelvic organs.

Acute Suppression of the Menses.—Menstruation is frequently suppressed from exposure to the inclemencies of the weather, and the flow may also be intentionally cut short by the use of a cold-water vaginal douche or a cold bath.

Psychic Conditions.—The influence of various emotions upon the function of menstruation has been fully demonstrated and amenorrhea from these causes is not infrequent. Thus, menstruation may be temporarily suppressed by grief, anger, fear, fright, anxiety, sudden joy, and other emotions, and among prisoners and the insane amenorrhea is a frequent occurrence. Married women who are sterile and anxious to become pregnant may have amenorrhea associated with tympanites. The fear of pregnancy following illicit intercourse frequently causes a temporary suppression, and a change of residence or associations often causes amenorrhea. Thus, it is common among emigrants and women who have taken a long sea voyage, and young girls who are sent to boarding-school often have a temporary suppression of menstruation. Menstrual irregularities are frequently observed in hysteric women, and surgical operations are frequently followed by temporary amenorrhea or menstrual irregularities due, no doubt, to mental shock; this is especially true of operative procedures upon the pelvic organs.

Symptoms and Diagnosis.—The absence of menstruation is the chief symptom. In some cases symptoms of the menstrual molimen show themselves and the patient suffers from flushes of heat, headache, bearing-down sensations in the pelvis, backache, disturbed digestion, nervousness, and hysteric epilepsy. Again, patients may suffer from hyperhidrosis and various forms of skin eruption, such as herpes, eczema, urticaria, and acne. The constitutional and general symptoms depend upon the cause of the amenorrhea.

The diagnosis of amenorrhea is the recognition of the cause, which must be determined in every case. The subjective symptoms must first be elicited and then a thorough physical examination made, not only of the pelvic organs, but of all the viscera of the body, as well as the blood, the urine, and the various excretions and secretions. An anesthetic must be employed if necessary in making the pelvic examination. Scanty menstruation is a relative term, and the normal type must first be determined before concluding that the symptom is pathologic.

Physiologic Causes.—Absence of menstruation is the only symptom in cases of amenorrhea dependent upon physiologic conditions, and the diagnosis is based

upon the recognition of the cause. Mistakes in diagnosis are only likely to occur early in pregnancy and in cases of ectopic gestation.

Congenital Causes.—Obstructions.—In these cases menstruation has never been established, and while the menstrual molimen occurs regularly, the flow is concealed by the obstruction. After the uterus has become distended with menstrual blood the patient may notice a swelling above the pubes, and she may suffer severe pain in the pelvis at each molimen on account of the increased distention at that time. In the course of a few days, however, the organs gradually accommodate themselves to the increased quantity of retained blood, and the acute pain ceases, leaving a sensation of weight or fullness in the pelvis.

The subjective symptoms in these cases are characteristic, and the diagnosis is confirmed when the physical examination reveals the obstruction. In the majority of cases the atresia is situated at the vulvovaginal orifice and is due to an imperforate hymen.

Imperfect Development or Absence of the Organs of Generation.—In cases of amenorrhea due to imperfect development of the organs of generation menstruation is either never established and there is no molimen, or there is a slight periodic effort upon the part of nature, which results in pelvic symptoms and a leukorrheal discharge streaked with blood. In the "*masculine type*" of women and in those in whom no sexual changes have taken place at puberty the subjective symptoms are absent and the flow does not appear. If the organs of generation are absent, menstruation is never established and the amenorrhea is permanent.

The diagnosis depends upon the physical examination, which reveals the cause and determines the condition of the genital organs. The infantile condition of the external and internal organs of generation as well as the breasts in a girl who has passed the usual period of puberty without menstruating shows that no sexual changes have occurred, but in professional athletes of the "*masculine type*" the diagnosis depends entirely upon the history of the patient, as the organs of generation are apparently well developed.

Acquired Causes.—Local.—Atresia of the vagina and uterus gives rise to the concealed form of amenorrhea. The menstrual molimen is present, and in time the blood accumulates in the vagina, the uterus, and the tubes, giving rise to pelvic pain and distress, and later on a tumor is felt in the lower abdomen. The diagnosis is based upon the history and physical examination.

Atrophy of the uterus from chronic metritis or superinvolution presents no characteristic symptom other than the absence of menstruation, and the diagnosis is based on the history and physical examination.

Atrophy of the ovaries as a cause of amenorrhea is very rare. In some instances there may be a menstrual molimen and the patient suffers with severe pain over the ovarian, lumbosacral, and hypogastric regions. The diagnosis is difficult and is based upon the subjective and objective symptoms as well as the history of the patient.

In cases of amenorrhea resulting from the removal of the uterus or its appendages the menopause is suddenly and prematurely established and vasomotor disturbances occur which are common to the normal "*change of life.*" The patient may suffer for an indefinite length of time from flushes of heat and chilliness; vertigo; faintness; numbness and heaviness in the extremities; sleeplessness; and an irritable condition of the nervous system. The diagnosis is based upon the history of the operation and the absence of the organs.

General.—In cases of amenorrhea dependent upon an exhausted state of the system the general symptoms are characteristic of the disease causing the

absence of menstruation, and the diagnosis is therefore based upon the recognition of the cause.

Acute suppression of the menses from exposure or the use of cold-water vaginal douches or a cold bath may or may not be attended with constitutional symptoms. In some cases general disturbances are not present and the flow returns on the following month. Others, again, are marked by profound constitutional symptoms, and menstruation is not re-established for several months. Sometimes grave pelvic complications may arise, such as inflammation of the uterus, the tubes, or the peritoneum, and the organs become permanently damaged. When constitutional symptoms are present, they are usually ushered in by a chill, followed by an elevation of temperature, rapid pulse, headache, and pain in the pelvic and lumbosacral regions. If the congestion of the pelvic organs is marked, there is a sensation of weight in the pelvis and the bladder becomes irritable. The diagnosis is based upon the symptoms and the history of the patient.

The symptoms of the *psychic causes* of amenorrhea differ somewhat according to the nature of the emotion producing the menstrual irregularity. Sudden emotions, as a rule, affect menstruation only when the flow has actually begun, and it usually reappears at the next period. Grief and sorrow, on the other hand, are more permanent in their results, and the same is true of cases of amenorrhea due to the mental depression affecting prisoners and the insane. Amenorrhea due to the fear of pregnancy following illicit intercourse usually lasts one or two months, and in cases of pseudocyesis the flow may be absent for an indefinite length of time. Amenorrhea due to a change of residence is not attended by any constitutional symptoms and the flow is re-established in a few months. It is not uncommon after operations upon the pelvic organs for the patient to miss her next menstrual period, and in occasional instances menstruation may be absent or irregular for several months.

Prognosis.—The prognosis of amenorrhea depends entirely upon the cause. The late appearance of puberty in young girls need cause no special anxiety unless the symptoms indicate a local or general cause for the delay. If, however, menstruation is not established before the nineteenth year, a physical examination should be made under an anesthetic and the cause of the trouble determined.

Treatment.—The treatment of amenorrhea depends upon the cause. The absence of menstruation is simply the manifestation of a local or general pathologic condition, and a careful study of the entire system must be made before resorting to therapeutic or hygienic measures. It should also be borne in mind that amenorrhea is not necessarily inconsistent with health except in cases in which the cause affects the general constitution of the individual.

The treatment is classified as follows into:

General treatment and hygiene.
Emmenagogues.
Treatment of the cause.

General Treatment and Hygiene.—In a large proportion of cases of amenorrhea the condition of the blood, nervous system, and nutrition is at fault, and the treatment must, therefore, be directed toward placing the general system and health of the patient in a normal state.

This is accomplished by the following means: (1) Rest; (2) exercise; (3) diet; (4) care of the bowels; (5) bathing; (6) massage; (7) electricity; and (8) the "rest cure."

Rest.—Many cases of amenorrhea are due to a broken-down condition of

the health and nervous system from loss of rest, and it is therefore important that at least eight hours a day be devoted to sleep. Mental rest is also essential, and all causes of worry and excitement must if possible be removed. Sexual intercourse is contraindicated in exhausted conditions, as it is an additional drain upon the system; but in cases in which the uterus and the ovaries require stimulation it is beneficial on account of the temporary congestion which it produces.

Exercise.—Systematic exercise in the open air and sunshine must be insisted upon, as well as the use of indoor exercises, which strengthen the abdomen and stimulate the pelvic circulation (see p. 117). Before deciding upon the character and amount of exercise to be taken the general condition of the patient must be considered and a thorough examination made of her heart, blood-vessels, and lungs.

Diet.—The diet must be carefully considered and articles of food selected to meet the indications in the management of each case.

Care of the Bowels.—The tendency to constipation should be corrected by exercise and a proper diet and the bowels opened once a day with a mild laxative. Aloes is especially indicated in cases of amenorrhea on account of its stimulating effect upon the pelvic circulation, and may be advantageously combined with cascara sagrada and podophyllin. Salines are also useful, and decided benefit is often obtained by giving the patient a bottle of citrate of magnesia once a week.

Bathing.—The care of the skin is important and the body must be bathed once a day. The method of bathing depends upon the indications in each case, and as amenorrhea is due to so many different causes, great care should be taken in selecting the character of the bath and the length of time devoted to bathing. Thus thermal baths are indicated in cases of obesity and contraindicated if the amenorrhea is associated with a lesion of the heart or blood-vessels; some patients are benefited by cold and others by hot water bathing; and, finally, in extreme cases of exhaustion it may be necessary to bathe the patient in bed.

Massage.—Pelvic and general massage are employed with advantage in many cases of amenorrhea; the former is more or less limited in its application, while the latter is valuable as a routine procedure in nearly all cases on account of its effect upon the general nutrition. Pelvic massage is indicated when amenorrhea is due to an undeveloped condition of the genital organs, and also after an acquired cause has been removed and the function of menstruation is slow in being re-established. General massage improves the nutrition, strengthens the heart and circulation, and increases muscular activity. It has therefore a wide range in the treatment of the causes of amenorrhea, and may be used advantageously in nearly all cases.

Electricity.—The static, faradic, and galvanic currents may be employed with advantage in the treatment of amenorrhea, and the application may be made generally over the entire body or locally over the pelvic organs. In the latter case one electrode is placed on the abdomen immediately over the symphysis pubis and the other either over the lumbosacral region or in the vagina; under no circumstances should the current be applied directly to the uterine cavity.

The Rest Cure.—Good results are obtained by a properly conducted rest cure in selected cases, and this plan of treatment is therefore employed with advantage when amenorrhea is associated with neurasthenia and allied conditions.

Emmenagogues.—These remedies excite the functional activity of the pelvic organs by stimulating the uterus and ovaries; increasing the pelvic circulation; and improving the general nutrition and the quality of the blood. The

physiologic action of the various emmenagogues must be borne in mind and the indications for their use carefully considered in every case. Thus, in cases of amenorrhea due to an exhausted state of the system no results will be obtained by the use of remedies that stimulate the uterus and ovaries, as the indications are to improve the nutrition and correct the quality of the blood.

Manganese.—This remedy is useful whenever an emmenagogue is indicated, and it is especially beneficial in acute suppression when the flow fails to return on the following month and in cases of scanty or irregular menstruation dependent upon uterine or ovarian inertia. Manganese is used in the form of binoxid of manganese (gr. j to ij, t. i. d.) or permanganate of potassium (gr. ss to j, t. i. d.), and may be administered alone or combined with other remedies. It should be given three or four times a day after eating and continued for several weeks. Its special physiologic action is to increase the flow of blood going to the pelvic organs.

The following formula is a useful combination:

℞. Potassii permanganatis, ... gr. xx
Acidi oxalici, ... gr. v
Ferri et quininæ citratis, ... gr. xl
M. et ft. pil. no. xx.
Sig.—One pill three times a day after meals.

Apiol.—This drug causes congestion of the pelvic organs and is useful as an emmenagogue when a direct action is required. It is, therefore, employed to re-establish menstruation after suppression from exposure to cold, emotions, etc.; in cases recovering from acute and chronic diseases; and in congenital and acquired forms of amenorrhea when the molimen is present. Apiol is administered in capsules in doses of three to six minims three times a day after meals, and should be given several days before the flow is expected.

Aloes.—This remedy is also a direct emmenagogue, causing congestion of the pelvic organs, and the indications for its use are the same as those for apiol and other stimulating emmenagogues. It may be given alone or combined with other drugs and administered for several days before the expected flow. The best preparations are purified aloes (gr. j to xx) and aloin (gr. $\frac{1}{10}$ to ij).

Oxalic Acid (gr. $\frac{1}{4}$–ss).—This drug is a very effective emmenagogue, and is especially useful when amenorrhea is due to such psychic causes as a change of residence, associations, etc. The general indications for its use are the same as those for other direct emmenagogues. Oxalic acid should be given alone or combined with other remedies in pill form or capsules and continued without interruption for three or four months.

Santonin (gr. j–iv).—This drug is indicated in amenorrhea due to chlorosis or anemia, and also to relieve the pelvic symptoms and bring on the flow in cases of acute suppression from exposure to cold.

Guaiacum.—This remedy is useful in amenorrhea associated with rheumatism. The ammoniated tincture of guaiac (♏x to fʒj) is the best preparation to employ.

Iron.—Preparations of iron are employed in the treatment of amenorrhea for their effect upon hematosis, and are, therefore, useful in cases of primary and secondary anemia, chlorosis, hysteria, and allied disorders. The vasomotor disturbances following the removal of the uterus or its appendages are greatly relieved and often cured by the administration of tincture of the chlorid of iron.

Strychnin.—This drug is useful as an emmenagogue on account of its influence upon the uterine tissues, the vasomotor centers, and hematosis, and is

given in the form of sulphate of strychnin or nux vomica—alone or in combination with other drugs.

Oil of Rue (♏ij to v).—This remedy is indicated in amenorrhea due to ovarian inertia and in cases of hysteria associated with anemia.

Oil of Tansy (♏ij to x).—This preparation is recommended in suppression of the menses from exposure to cold, and is given in pill form or capsules or it may be dropped on a lump of sugar.

Oil of Hedeoma (♏ij to x).—This remedy is beneficial in acute suppression from exposure to cold and in cases of amenorrhea due to emotional causes.

Savine.—This drug causes congestion of the pelvic organs and is employed when a direct emmenagogue is indicated. The oil of savine (♏ij to iv) is employed.

Salicylic Acid.—This remedy is a useful emmenagogue on account of its stimulating effect upon the pelvic circulation and its anti-rheumatic action.

Cimicifuga.—This drug is especially indicated in amenorrhea due to mental depression and cases dependent upon allied psychic conditions. The fluid extract in half-drachm doses is employed.

Gold.—Gold and sodium chlorid (gr. $\frac{1}{50}$ to $\frac{1}{10}$) has been successfully used in cases of amenorrhea due to neurasthenia and exhausted states of the system.

Hoang-nan.—This drug is recommended in amenorrhea as a general tonic and is indicated in cases of malnutrition and anemia. The fluid extract (♏v to xxx) is employed.

Other Remedies.—Among other drugs used as emmenagogues may be mentioned leonurus, or motherwort, fluid extract, ʒj–ij; tincture of myrrh, ʒss–ij; polygonum or water pepper, fluid extract, ♏x–ʒj, for several days before the expected flow; sanguinaria, gr. ij–xx, or its tincture, ♏x–ʒi; senega, fluid extract, ♏x to xx; and serpentaria, fluid extract, ♏x–xxx.

Treatment of the Cause.—Congenital Causes.—Amenorrhea due to congenital atresia is a surgical affection and is treated upon the principles laid down elsewhere.

If the symptom is due to the absence of the organs of generation, the condition is permanent and nothing can be done.

In cases dependent upon imperfect development of the organs little or nothing can be accomplished, and the question of treatment depends upon the absence or presence of the molimen. If the molimen is absent, all forms of treatment are useless; but if it is present, good results will be obtained at times by dilatation and curetment of the uterus, followed by attention to the general hygienic conditions; the employment of massage and electricity; and the administration of emmenagogues. If the treatment fails to establish menstruation and the health of the individual suffers on account of the molimen and the nervous symptoms, it may be necessary in some instances to remove the uterine appendages.

In the "*masculine type*" of women and in cases of amenorrhea due to the absence of sexual changes at the time of puberty the molimen is not present and no form of treatment is of any use.

The question as to the advisability of the marriage of a woman who has an imperfectly developed uterus or ovaries is a serious one, and she, as well as her prospective husband, must be informed of the practical certainty of sterility even if there is more or less molimen and the treatment has resulted in establishing a slight flow at the monthly periods. In all cases of congenital amenorrhea a physical examination must be made before considering the question of marriage,

as the physical defects in the organs of generation may be obstructive in character and render sexual intercourse impossible.

Acquired Causes.—*Local.*—Amenorrhea due to atresia of the vagina or cervical canal is obstructive in character and is treated upon the principles described elsewhere.

In cases of superinvolution or atrophy of the uterus treatment may be followed by favorable results if the cavity of the organ does not measure less than two inches and a molimen is present. The treatment, which is directed toward the stimulation of the uterus and the improvement of the general health, is the same as in the congenital forms, and is described elsewhere. Scarification of the cervix is of benefit in these cases and increases the flow of blood to the pelvic organs. It should be performed twice a week for an indefinite length of time and also when the molimen is present.

If the amenorrhea is due to exhaustion dependent upon a large ovarian tumor menstruation is usually re-established along with the improvement in the general health of the patient after the removal of the growth.

The removal of the uterus or its appendages is followed by a permanent cessation of menstruation, and the symptoms of the artificial menopause which result are treated upon the principles laid down on page 697.

General.—Amenorrhea due to an exhausted state of the system dependent upon acute and chronic diseases is treated upon general medical principles, and there are no special indications to meet from a pelvic standpoint, as menstruation returns when the patient is restored to health.

The largest number of cases of amenorrhea are due to bad hygienic habits and surroundings, and the treatment is based upon the correction of the injurious conditions and attention to the patient's general health. Indolent and sedentary habits must be corrected and the patient instructed to exercise every day in the open air and sunshine. Women whose occupation or means will not permit them to take outdoor exercise should walk to and from their place of business and employ indoor exercises for a few minutes every night and morning.

Young girls who overstudy and are confined too closely in the class-room must be given shorter hours and less brain work, and if necessary taken away from school for an indefinite length of time.

The treatment of amenorrhea due to the alcoholic or drug habit is based upon the correction of the abuse; meeting special indications as they arise, and attention to general hygiene.

Women who suffer from amenorrhea the result of overwork, insufficient food, bad general hygiene, and impure air should be treated upon general medical principles and a change made, if possible, in their occupation. These patients are also benefited by the administration of iron and tonics and careful attention to the regulation of the bowels. The "Mixture of the Four Chlorides" (Goodell) is often indicated, and may be given in the following combination:

℞. Hydrargyri chloridi corrosivi,..... gr. j
Liquoris arsenici chloridi,..... gtt. xlviij
Tincturi ferri chloridi,
Acidi hydrochlorici diluti,.....āā f ℥iv
Syrupi zingiberis,.....q. s. ad f ℥vj
M. Sig.—One dessertspoonful in water after each meal.

Amenorrhea due to acute anemia is usually temporary and requires no special gynecologic treatment.

The treatment of amenorrhea due to obesity is based upon general medical principles, and includes diet, exercise, thermal baths, drugs, and general hygiene. The indications in each case must be carefully studied and a thorough examina-

tion made of all the organs of the body in order to determine the character of the treatment. Local medication and the administration of emmenagogues are not indicated until the excess of fat has been reduced and the general health improved. The uterine cavity is then dilated and cureted and stimulating emmenagogues administered.

The treatment of suppression of the menses from exposure to cold after the flow has begun depends upon the absence or presence of local and constitutional symptoms. In some cases they are entirely absent and no special treatment is indicated, as the flow returns naturally on the following month, although it is advisable, however, to keep the patient indoors for a few days as a precautionary measure. If symptoms accompany the suppression, the patient must be put at once to bed; mustard applied over the hypogastrium and lower extremities; and a saline purge administered, preferably a bottle of citrate of magnesia. Diaphoresis should be excited by broken doses of Dover's powder, and hot-water bags applied to the body, and if the pelvic pains are severe full doses of opium are given by the bowel. A hot sitz-bath sometimes gives great relief and may be employed in cases in which there is acute distress in the pelvis. If menstruation does not return on the following month, systemic and local treatment must be instituted and every effort made to restore the menstrual flow. The patient should be given a pill consisting of quinin, iron, and strychnin, and permanganate of potassium should be administered (gr. ij, t. i. d.) for its emmenagogic effect. The local treatment consists of warm water vaginal douches night and morning and the introduction of a cotton-wool tampon saturated with glycerin and ichthyol (25 per cent.) into the vagina twice a week.

If the amenorrhea still persists and there is no indication of a return of the menses, dilatation and curetment of the uterine cavity should be performed in order to stimulate the uterus and increase the flow of blood to the pelvic organs.

Amenorrhea dependent upon psychic causes is difficult to cure and often taxes the resources of the attending physician. Sudden emotions, such as anger, fright, and joy, usually cause only a temporary cessation of the menstrual function, and the administration of sedatives is all that will be required to re-establish the flow unless constitutional and local symptoms intervene, in which case the patient should be treated upon the principles laid down in discussing the management of acute suppression from exposure to cold.

The causes of such emotions as grief, fear, and anxiety are always more or less permanent in character, and consequently when amenorrhea results it persists until the mental state is relieved. There is no special treatment indicated in these cases and emmenagogues and local medication do but little good. The cause must be removed if possible and the patient encouraged to take a more sensible view of her troubles and look upon the bright side of life. The moral influence and personality of the physician are of great assistance in the treatment of these cases, as many of the patients are neurasthenic and require the "rest cure," and others, again, who are less profoundly affected may be treated upon general medical principles. The most difficult patients to treat are women of education and refinement who have limited means and cannot afford the necessary expense of a thorough course of treatment.

Amenorrhea due to fear of pregnancy following illicit intercourse, pseudocyesis, and mental depression occurring in prisoners and the insane is psychic in origin and requires no special form of treatment. Suppression of menstruation following a change of residence is temporary, as a rule, and should be treated by stimulating emmenagogues and general tonics. Amenorrhea following surgical operations is unimportant from the standpoint of treatment and requires no special attention.

VICARIOUS MENSTRUATION.

Definition.—A periodic bleeding occurring from any part of the body, except the uterus, at the time of the normal menstrual flow is known as *vicarious menstruation.* If the ectopic bleeding is associated with the uterine flow, it is then spoken of as *supplementary menstruation.*

In vicarious menstruation there is no bleeding from the uterus, and in the supplementary variety the uterine flow, as a rule, is scanty. In cases of vicarious menstruation other discharges may take the place of the ectopic bleeding, and there may be a monthly secretion of colostrum, a profuse leukorrhea, or a diarrhea.

Frequency.—Ectopic bleeding is a rare menstrual irregularity, and is most often met in cases of undeveloped genital organs, atresia, and premature menopause.

Situation.—The nose is the most frequent site, although the bleeding may occur from any part of the body, and take place from the respiratory tract, the nose, the larynx, the bronchial tubes, the lungs, the alimentary canal, the gums, the buccal cavity, the stomach, the intestines, the rectum, and the anus. Vicarious bleeding may also occur at the site of an old scar or wound; from a raw surface or ulceration; and from the ear, the conjunctiva, the kidneys, and the bladder. In some cases a monthly secretion of colostrum or bleeding may take place from the nipples; while in others the hemorrhage is subcutaneous and petechial spots or ecchymoses are observed.

Symptoms.—The characteristic symptom is the ectopic bleeding. The pelvic manifestations of the molimen are present, and at the situation of the vicarious hemorrhage the parts become painful, congested, and swollen. Women who suffer from this form of menstrual irregularity, as a rule, are neurasthenic.

Prognosis.—The seriousness of the symptom depends upon the situation of ectopic bleeding and the general condition of the patient. Hemorrhages from the respiratory or alimentary tract are serious, and the prognosis must be guarded. Again, the dangers of cerebral apoplexy must be taken into consideration, and cases are on record in which the sudden stopping of the vicarious bleeding has been followed by a hemorrhage of the brain.

Diagnosis.—The diagnosis is based on the periodicity of the ectopic bleeding; its coincidence with the pelvic molimen; and the characteristic pain, congestion, and swelling in the tissues at the site of the hemorrhage. A careful differentiation must be made between an organic lesion and vicarious bleeding where the hemorrhage comes from the respiratory or alimentary tract.

Treatment.—As vicarious menstruation is closely associated with amenorrhea and the supplementary form with a scanty menstrual flow, the treatment is necessarily directed toward establishing the normal functions of the uterus and its appendages. The first consideration is the recognition of the causes and their subsequent removal, and as these subjects have been discussed under amenorrhea and scanty menstruation, they need not, therefore, be repeated here. It must be remembered, however, that the condition is most often met in cases of undeveloped genital organs, atresia, and premature menopause, and that these women are, as a rule, more or less neurasthenic. In cases of atresia the removal of the obstruction is indicated, and in women with undeveloped genital organs the question of the extirpation of the ovaries must be considered if the palliative treatment fails to effect a cure.

In a large proportion of cases of vicarious menstruation the condition of the blood, the nervous system, and the nutrition is below par, and careful attention

must therefore be given to the general treatment, which is discussed under amenorrhea on page 711.

The use of emmenagogues, especially those which are direct in their action, is indicated, and no special local treatment is needed at the site of ectopic bleeding unless it becomes excessive, in which case it should be controlled by proper surgical and medical means.

DYSMENORRHEA.

Definition.—Dysmenorrhea is painful menstruation. The majority of women suffer more or less general and local discomfort at the time of the menstrual period, but the symptoms are not marked, and in no way interfere with their habitual mode of life; in comparatively rare instances menstruation is unattended with any subjective symptoms.

Causes.—Dysmenorrhea may result from:

Neuralgia.
Diathesis.
Pelvic congestion and inflammation.
Malformed or undeveloped genital organs.
Obstruction.

Neuralgia.—In dysmenorrhea due to neuralgia the pelvis may or may not be the seat of disease, and in some cases no evidence of any pathologic lesion can be discovered, while in others there may be some slight abnormal condition which would not of itself cause pain at the menstrual period unless the patient was also neuralgic. Dysmenorrhea due to neuralgia is associated with a depraved state of the blood, nervous system, and general nutrition, and under these circumstances the nerves are over-sensitive and the congestion incident to menstruation causes pain. This form of painful menstruation is met very frequently, and is due to constitutional diseases, habits, and environment. Among the causative diseases may be mentioned hysteria, malaria, syphilis, chlorosis, anemia, plethora, and inherited neurosis. The habits of a patient are also often the cause of an exhausted state of the system, and the affection may result from high living, a sedentary mode of life, or mental and physical overwork. Onanism, masturbation, and excessive sexual indulgence may result in neurasthenia, and the menstrual irregularities met in young women are but too frequently the result of our false modern methods of education, which require long hours of hard and exhausting study during the period of puberty. Painful menstruation is also due to bad hygienic surroundings, and obstinate constipation may result in neuralgia from the absorption of fecal matter by the blood.

Diathesis.—Gout and rheumatism may produce pelvic disturbances and cause painful menstruation.

Pelvic Congestion and Inflammation.—These conditions are frequently the cause of dysmenorrhea, and women who are married and have borne children are naturally more or less liable to this form of the affection for the reason that a large proportion of the causes of congestion and inflammation are directly due to sexual intercourse and child-bearing. The normal local congestion of menstruation is unattended by pain, but when a pelvic lesion is present which interferes with the circulation venous stasis results and dysmenorrhea follows as a natural sequence.

Among the causes producing congestion and inflammation of the pelvic organs are, acute suppression of the menses from exposure to cold, overexertion, intestinal disorders, uterine tumors, polypi and displacements, subinvolution, chronic hyperplastic endometritis, and varicocele and tumors of the broad ligaments. Pelvic adhesions, chronic pelvic peritonitis, acute and chronic diseases

of the tubes and ovaries, prolapse of the uterine appendages, tumors of the ovary, and torpidity of the portal circulation also cause pelvic congestion and result in dysmenorrhea.

Malformed or Undeveloped Genital Organs.—Dysmenorrhea caused by congenital malformations may be produced in two ways: First, by an ineffectual molimen provoking uterine colic, and, second, by a stenosis or atresia of the genital tract causing an obstruction to or a retention of the flow.

Obstruction.—In dysmenorrhea due to acquired obstruction the menstrual function is normal up to the point of the flow beginning to escape from the genital canal, and at this stage the discharge meets with a stenosis or an atresia, either in the cervix, the vagina, or at the vulvovaginal orifice. If a stenosis is present, difficult and painful menstruation results; but if the obstruction is due to atresia, the menstrual blood is retained. In cases of stenosis the temporary retention of the flow excites uterine contractions, which become more and more severe as the blood continues to accumulate, and finally by a violent effort the uterus forces the discharge and clots past the obstruction and the pain ceases until the overdistention occurs again, when the same phenomena are repeated. In cases of atresia there is a periodic increase in the amount of retained blood, and the molimen is attended with painful contractions due to overdistention of the vagina, the uterus, and the tubes.

The chief causes of acquired obstruction of the genital canal are: flexions of the uterus; small polypi situated at or near the internal os; cervical stenosis and atresia; chronic endometritis; vaginal stenosis and atresia; and exfoliative endometritis.

Uterine flexions are a common cause of dysmenorrhea; the bend in the uterine canal forms an angle which obstructs the flow of blood, and the coexisting endometritis causes a thickening of the mucous membrane which materially increases the stenosis. Finally, the congestion incident to menstruation swells the inflamed endometrium and still further increases the obstruction. Anterior flexions are a more frequent cause of dysmenorrhea than posterior displacements, and are more common in unmarried and sterile women than in those who have borne children. Small polypi are sometimes situated at or near the internal os and act as a ball-valve in keeping back the menstrual flow. Cervical stenosis and atresia may be caused by caustic applications, the use of the actual cautery, inflammation of the mucous membrane, malignant disease, and an improper technic in operations upon the cervix, and obstructions of the vagina may be due to ulcerations following the traumatism of labor or as a sequela of typhus fever, tuberculosis, diphtheria, and syphilis.

Exfoliative endometritis, while not a common affection, may occur at any period of menstrual life, from puberty to the menopause, and is found to be more frequent in unmarried and sterile women than in those who have given birth to children. The uterine colic which occurs at the time of menstruation is caused by the expulsion of a membrane (*membranous dysmenorrhea*) which consists of the hypertrophied menstrual decidua, and is expelled as a complete cast of the uterine cavity or is thrown off in shreds. Membranous dysmenorrhea is inflammatory in origin and is caused by interstitial endometritis.

Symptoms.—Pain associated with the menstrual function is the characteristic symptom of dysmenorrhea. The situation of the pain, its character, and its relation with the appearance and duration of the flow differ widely in many instances and depend largely upon the cause of the affection.

The situation of the pain is not constant and varies even in cases in which the etiology of the dysmenorrhea is the same. It is most frequently located, however, in the hypogastrium, and may also be situated in the pelvic cavity, behind

the symphysis pubis, in the loins, and over the lumbosacral or inguinal region. In severe attacks of dysmenorrhea the pain may radiate down the thighs, into the abdomen, thorax, or more remote parts of the body, and in exceptional cases the breasts become painful and tender.

The character of the pain also varies, and is described as constant, intermittent, remittent, fixed, shooting, expulsive, labor-like, sharp, dull, bearing-down, heavy, and dragging.

There is no constant relation existing between the pain and the appearance or duration of the flow, although in some cases such a relationship does exist and may indicate the origin of the dysmenorrhea.

In severe cases of dysmenorrhea the general health suffers, and nervous symptoms are likely to manifest themselves. Some patients become neurasthenic, while others, in rare instances, may develop hysteric epilepsy. An acute attack of dysmenorrhea leaves the patient weak and exhausted and unable to attend to her duties for several days. Nausea and vomiting are frequently associated with the attack and gastro-intestinal disturbances may continue after the cessation of the flow.

Neuralgia.—The pain, as a rule, begins before the flow and ceases with its appearance. In some cases it may continue intermittently or remittently during the entire flow, and in others it may not cease for some time after the period. The pain varies in severity, and in some cases it may be slight, while in others the agony becomes so acute that the patient becomes wildly hysteric or faints. It is not fixed in one location, as a rule, and shoots from the pelvis down the thighs or into the abdomen and thorax. The general health of the patient is bad, owing to the constitutional cause of the dysmenorrhea and the exhaustion which follows the monthly suffering.

Diathesis.—The attacks of dysmenorrhea are irregular and the patient may be entirely free from pain for several periods. As a rule, they occur simultaneously with manifestations of gout or rheumatism in other parts of the body. The pain usually begins a short time before the flow and continues remittently throughout the entire period, or it may gradually cease as the flow is established. It is situated in the pelvis and hypogastric region, and may be felt as a dull ache or it may be sharp and agonizing.

Pelvic Congestion and Inflammation.—This form of dysmenorrhea being due to a local pelvic disease, the pain is generally an exaggeration of that which is felt during the intermenstrual period, and is referred chiefly to the organs involved. It is therefore situated mostly within the pelvis, in the back and the hypogastric and inguinal regions, and at times it may shoot down the thighs. The character of the pain may be dull, heavy, bearing-down, or dragging, and it is seldom as sharp and acute as in the neuralgic form of dysmenorrhea. The pain usually precedes the flow and gradually ceases after it is fully established. There are many exceptions, however, to this rule, and the pain may have various relations with the flow.

The local and constitutional symptoms of acute congestion from exposure to cold have been described under amenorrhea, where they properly belong; and while suppression of the menses from this cause is usually associated with local pain, the chief symptom is the suppression of the menses, which need not be discussed here.

Malformed or Undeveloped Genital Organs.—The symptoms depend upon the character of the congenital condition. If the organs are undeveloped, the molimen is very painful and there is little or no discharge of blood. If stenosis exists, menstruation is difficult and the pain is paroxysmal and expulsive in character. If the cause is due to atresia, the flow is permanently retained

beyond the point of obstruction, and the pain which occurs along with the subjective symptoms of menstruation is due to distention of the organs by the fresh accumulation of menstrual blood.

Obstruction.—The symptoms of acquired obstruction are the same as in the congenital variety, and the pain begins before the flow makes its appearance. It is paroxysmal and expulsive in character and continues, as a rule, during the entire period. The temporary damming-back of the menstrual blood excites uterine contractions (*uterine colic*), which become more and more severe as the distention increases, and finally, by a violent effort, the uterus forces the discharge and clots beyond the point of obstruction. The pain then ceases until the blood begins to reaccumulate in the uterine cavity, when the obstructive paroxysms begin again and the same phenomena are repeated.

If the obstruction is due to *exfoliative endometritis*, the violence and duration of the pain depend upon whether the membrane is expelled as a cast of the uterine cavity or is thrown off in shreds. The pain begins with menstruation and continues to grow more and more severe, becoming labor-like or expulsive in character, until finally the uterus empties itself and the membrane is expelled. During this process the cervical canal becomes dilated, and after the expulsion of the membrane the pain ceases and does not recur unless a portion of the cast still remains in the uterine cavity. The expulsion of the membrane is usually followed for a few hours by excessive bleeding, and during the intermenstrual period there is a purulent or sanguineo-purulent leukorrhea.

If the dysmenorrhea is due to atresia, the menstrual blood is permanently retained and the symptoms are the same as in the congenital form.

Diagnosis.—The diagnosis of dysmenorrhea is the recognition of the cause, which is determined by a careful consideration of the local and general symptoms and a thorough examination not only of the pelvic organs but of the entire system. The character of the pain and its relation to the flow are too uncertain and variable to be of much value from a diagnostic standpoint. An exception, however, to this statement is met in dysmenorrhea due to congenital or acquired stenosis, and in this class of cases the expulsive and labor-like character of the pain is almost pathognomonic.

Neuralgia.—The character of the pain and its relation to the appearance and duration of the flow must be carefully considered. The physical examination of the pelvis gives negative results, and the diagnosis is finally based upon the recognition of a systemic cause for the neuralgia.

Diathesis.—The diagnosis is based upon the symptomatology and the presence of gout or rheumatism. The physical examination is negative.

Pelvic Congestion and Inflammation.—The pain in this form of dysmenorrhea is peculiar in that it is generally an exaggeration of the suffering experienced during the intermenstrual period and is referred chiefly to the organs involved. The character of the pain and its relation to the flow have already been discussed. The diagnosis is based upon a physical examination and the recognition of a gross pelvic lesion.

Malformed and Undeveloped Genital Organs.—The diagnosis depends upon the symptomatology and physical examination. In cases of undeveloped organs the painful and ineffectual molimen is pathognomonic. Atresia results in the retention of the flow, while stenosis produces difficult menstruation, characterized by expulsive and labor-like pains followed by the discharge of blood and clots.

Obstruction.—Atresia causes retention of the flow and stenosis produces difficult and painful menstruation. The diagnosis is based upon a physical examination and the recognition of the character of the obstruction.

In cases of dysmenorrhea due to *exfoliative endometritis* the discharge of a cast of the uterine cavity or shreds of menstrual decidua with the flow is pathognomonic. The discharged membrane may be mistaken for an early abortion, and a microscopic examination should be made to confirm the diagnosis.

Prognosis.—The prognosis depends upon the nature and duration of the cause and the general condition of the patient. There is always a cause for dysmenorrhea, although it may be obscure in some cases, and failure in the treatment frequently results from a hasty and careless diagnosis. It is necessary, therefore, in every case to make a thorough study of the symptoms and a careful examination not only of the pelvis but of all the important organs of the body.

Neuralgia.—The prognosis, as a rule, is favorable. The nature of the cause and the ability of the patient to carry out the treatment must always be considered.

Diathesis.—This form of dysmenorrhea is dependent upon a gouty or rheumatic diathesis, and the prognosis depends upon the relief or cure of the cause.

Pelvic Congestion and Inflammation.—The prognosis must be guarded in this form of dysmenorrhea, as the symptom of painful menstruation in the vast majority of cases is of secondary importance from the standpoint of treatment. The local lesion which causes the dysmenorrhea claims our attention and the prognosis depends upon its relief or cure. Many of these lesions require the removal of the uterus or its appendages or both, and incidentally the dysmenorrhea is relieved by the artificial menopause which follows the operation.

The prognosis is favorable in cases of acute congestion from exposure to cold, overexertion, etc.; uterine tumors and polypi removable without mutilation; uterine displacements and subinvolution; chronic hyperplastic endometritis; intestinal disorders and torpidity of the portal circulation due to benignant causes; prolapse and unilateral disease of the uterine appendages, and also operable diseases of the broad ligaments.

Malformed or Undeveloped Genital Organs.—In cases of undeveloped genital organs the prognosis is bad, and little or no good will result from treatment. Young girls who are late in reaching puberty owing to want of nerve force and defective nutrition are usually benefited by treatment, and menstruation is eventually established. The prognosis in cases of stenosis or atresia of the genital canal depends upon the nature and situation of the obstruction. An imperforate hymen is readily relieved by surgical means, and in cases in which the vagina is absent and the uterus and ovaries are normal the prognosis is favorable provided a permanent outlet can be made for the menstrual flow.

Obstruction.—The prognosis is generally favorable. Atresia of the cervical canal or vagina is readily relieved by an operation, and in cases of stenosis due to flexions of the uterus, small polypi, chronic endometritis, etc., the operative results are good.

About 80 per cent. of the cases of dysmenorrhea due to acute anteflexion of the uterus are cured by dilatation and curetment of the uterus, and 20 per cent. are more or less benefited. *Exfoliative endometritis* is an obstinate disease to cure and the prognosis must be guarded.

Treatment.—The successful treatment of the affection depends upon the recognition and removal of the cause. The administration of alcohol and opium in the treatment of dysmenorrhea should be condemned as a routine practice, as they are not curative and the patient may become addicted to their use.

The treatment is classified as follows:

General treatment and hygiene.

Drugs.

Treatment of the cause.

General Treatment and Hygiene.—These subjects are considered under the following headings: (1) Rest; (2) exercise; (3) diet; (4) care of the bowels; (5) bathing; (6) clothing; (7) counter-irritation; (8) vaginal douches and tampons; (9) change of residence; (10) massage; (11) electricity; (12) and the "rest cure."

Rest.—Physical rest is important, and the patient should remain in her room during the flow or at least while the pain lasts. Sexual intercourse should be forbidden in cases of dysmenorrhea due to exhausted states of the system or gross pelvic lesions, and the husband and wife should occupy separate beds.

Exercise.—Exercise in the open air and sunshine and the use of indoor exercises are important factors in the treatment and should be insisted upon by the attending physician in properly selected cases. The nature of the cause of the dysmenorrhea, however, must be considered, and patients who are suffering from gross pelvic lesions or organic diseases of important organs should not be allowed to take violent forms of exercise.

Diet.—The diet should be carefully regulated and the systemic conditions considered in selecting articles of food. The kidneys must be kept active and the patient encouraged to drink plenty of pure water in order to flush the system and eliminate the waste products which are factors in the causation of many cases of dysmenorrhea.

Care of the Bowels.—The bowels must be carefully regulated in order to correct the tendency to constipation and prevent the absorption of fecal matters by the blood. As a rule, a simple laxative, such as the fluid extract of cascara sagrada, alone or combined with podophyllin, is all that will be required, and in cases in which the dysmenorrhea is dependent upon an inflammatory pelvic lesion salines are especially beneficial, as they deplete the pelvic circulation and lessen the congestion.

Bathing.—The skin must be kept active by a daily bath of the entire body. The method of bathing depends upon the indications in each case. Turkish or Russian baths are very beneficial, especially in cases due to neuralgia or the uric acid diathesis, and also in other forms of dysmenorrhea on account of the general relaxation of the system which follows their use. Hot sitz-baths frequently give a great amount of comfort to the patient, relieve the severity of the pain, and are specially indicated in cases of acute congestion, neuralgia, uric acid diathesis, and ineffectual molimen due to imperfectly developed genital organs. A full hot bath continued for fifteen to twenty minutes is often followed by good results and frequently lessens the acuteness of an attack or even aborts it. Sea bathing is also curative in certain cases, and is especially indicated when a general tonic action is required.

Clothing.—Wool should be worn next to the skin except in hot weather, to protect the body from sudden changes of temperature and equalize the pelvic circulation. This precaution is an important part in the management of dysmenorrhea, and is especially indicated in cases due to neuralgia, uric acid diathesis, ineffectual molimen, congestion and inflammation of the uterus, and lesions of the uterine appendages. A flannel bandage should be worn over the abdomen and the clothing should not constrict the waist and crowd the viscera down upon the pelvic organs.

Counter-irritation.—Tincture of iodin applied on the skin of the abdomen directly over the position of the ovaries and to the vault of the vagina is

beneficial in the treatment of dysmenorrhea, and is especially indicated in the neuralgic form of the affection. The applications should be made three times a week to the vaginal vault and once a day on the skin of the abdomen. Dry cups applied to the abdomen are also of benefit, and may be employed in cases due to neuralgia and pelvic congestion.

Vaginal Douches and Tampons.—Hot-water vaginal douches are of the utmost importance in the treatment, and should be employed in cases of dysmenorrhea due to neuralgia, diathesis, pelvic congestion, or inflammation and stenosis of the genital tract due to uterine flexions. They are useful not only during the intermenstrual period, but also at the time of an attack, as they lessen the severity of the pain and relieve the uterine spasm.

Vaginal tampons of cotton-wool saturated with a solution of glycerin and ichthyol (25 per cent.) often serve a useful purpose in the treatment of dysmenorrhea and are indicated in cases due to neuralgia and pelvic congestion. A tampon should be introduced into the vagina every night before going to bed and removed on the following morning; its use should be discontinued during the menstrual flow.

Change of Residence.—A change of residence is often followed by curative results, and is especially indicated in cases of dysmenorrhea due to neuralgia, diathesis, and an ineffectual molimen in girls in whom the changes of puberty are delayed.

The climate must be carefully selected to meet the indications, and patients who suffer from neuralgia or uric acid diathesis should be advised to live south during the winter and early spring months, as these seasons are particularly injurious under the circumstances in the northern sections of this country. The sea air seems to have a beneficial effect in some cases, and I have met a number of patients having severe and obstinate dysmenorrhea, without any apparent local or general cause to account for the symptoms, who never suffered the slightest pain during the menstrual periods while residing at the seashore or taking a sea voyage.

Massage.—Pelvic and general massage are of distinct advantage, and should be employed in the treatment of certain cases of dysmenorrhea. General massage has a wide range of usefulness, and may be employed as a routine practice on account of its effect upon the heart, nutrition, and muscular system. Pelvic massage, however, has a more or less restricted application, and is contra-indicated in cases due to inflammatory lesions of the uterine appendages and peritoneum. Good results follow its use in cases dependent upon neuralgia, uric acid diathesis, undeveloped organs, and chronic uterine congestion caused by a retrodisplacement or subinvolution.

Electricity.—Electricity is useful on account of its general tonic effect in the treatment of dysmenorrhea, and it may be employed in the form of the static, faradic, or galvanic current. The local application of the current is indicated in cases due to neuralgia, diathesis, undeveloped genital organs, and chronic uterine congestion. One electrode should be placed over the hypogastrium and the other over the lumbosacral region or in the vagina; under no circumstances should the current be applied directly to the uterine cavity.

The Rest Cure.—This form of treatment has a limited application and is indicated in cases of dysmenorrhea associated with neurasthenia or nerve exhaustion.

Drugs.—The following remedies are recommended in the treatment of dysmenorrhea:

Apiol.—This drug is administered in capsules and is given in doses of from three to five minims, three times a day after eating, for one week before the

period, and if necessary during the flow. It is very effective in the neuralgic form of dysmenorrhea, and good results have followed its use in cases of uterine colic dependent upon stenosis. As a routine remedy it may be tried in all cases of dysmenorrhea and for the relief of pain during an acute attack.

Phenacetin.—This remedy is given in doses of from two to ten grains three or four times a day. The best results are obtained, however, by giving five grains every half-hour and discontinuing its use after six doses are taken. The remedy is useful in all forms of dysmenorrhea, and is especially indicated when the symptoms are associated with neuralgia or uterine spasm.

Antipyrin.—This preparation is given in doses of from two to ten grains. The indications for its use and the method of administration are the same as phenacetin. The depressing action of antipyrin upon the heart should be borne in mind, and guarded against by the use of strychnin.

Pulsatilla.—This drug is given in the form of the tincture in doses of five drops three times daily for one week before the flow. It has a decided sedative action and is especially useful in cases of neuralgia.

The Bromids.—The bromid of ammonium, potassium, or sodium is administered in doses of from twenty to thirty grains, three or four times a day. Bromid of sodium is preferable to the other salts and is less irritating to the stomach. The bromids are given for one week before the period and continued, if necessary, during the flow. They lessen pelvic congestion and are sedative and antispasmodic in their action. While useful in cases associated with congestion and uterine colic, they are especially valuable in the neuralgic forms and in dysmenorrhea due to ovarian irritation. The action of the bromids is increased by combining them with valerian, gelsemium, and asafetida.

Tincture of Cannabis Indica.—(Dose, ♏ x–xx.) This remedy is efficacious in many forms of dysmenorrhea to relieve the acute suffering, and must be given freely in twenty-drop doses every three hours, so as to get its full physiologic action. Cannabis indica is analgesic and antispasmodic in its action, and therefore a good routine remedy, especially in cases associated with uterine colic and neuralgia.

Camphor.—This drug is often effective in the treatment of dysmenorrhea on account of its antispasmodic and anodyne action. It is not as prompt in its action, however, as some of the other remedies, and is, therefore, not employed, as a rule, in severe cases. In the milder forms of neuralgic and obstructive dysmenorrhea its use is followed by good results, and it may be given in a two-grain pill every two, three, or four hours during the attack. Monobromated camphor is probably preferable to camphor itself, and is given in four- to five-grain doses every three or four hours while the pain lasts.

Viburnum Prunifolium, or black haw, Piscidia Erythrina, or Jamaica dogwood, and Hydrastis Canadensis, or goldenseal, are useful remedies in the treatment of dysmenorrhea, and may be given in a combination known as "Liquor Sedans" (Parke, Davis & Co.), which is a very effective and agreeable preparation. Every fluidounce contains 60 grains each of goldenseal and black haw and 30 grains of Jamaica dogwood; the dose is from one to two fluid drachms. These remedies are more or less slow in their action, and are, therefore, of but little value if used only at the time of an attack. They should be given for two or three months during the intermenstrual periods and continued when the flow appears. They are especially beneficial in cases of dysmenorrhea associated with menorrhagia or neuralgia, and in the membranous form excellent results have followed the administration of 30 drops each of the fluid extract of black haw and goldenseal given twice a day, beginning eight or nine days before menstruation and continued during the flow.

Amyl Nitrite and Nitroglycerin.—These remedies are valuable in the treatment of an acute attack of neuralgic dysmenorrhea. The former is given by inhalations in doses of 3 to 5 minims, and the latter is administered hypodermically in a dose of $\frac{1}{100}$ of a grain.

Salicylate of Sodium (gr. x–ʒj) and Ammoniated Tincture of Guaiac (♏ x–fʒj).—Either of these remedies is very efficacious in the treatment of dysmenorrhea due to uric acid diathesis, and if given for one week before the menstrual period will frequently prevent an attack.

Alcohol; Opium; and Chloral Hydrate.—These drugs must be used with great caution in the treatment of dysmenorrhea on account of the danger of the patient becoming addicted to their use. If opium is employed, it should be administered either hypodermically or by the rectum.

General Anesthesia may at times be required in the treatment of an acute attack of dysmenorrhea when the pain is very severe or the patient becomes hysteric, and under these circumstances chloroform should be used in preference to ether.

Other Remedies.—Among other drugs used in dysmenorrhea are oxalate of cerium, gr. j–x; acetanilid, gr. v–xv; exalgin, gr. j–vj, or from six to twelve grains in twenty-four hours; cimicifuga in congestive dysmenorrhea; fluid extract of collinsonia, fʒss–j, for one week preceding and during the flow; aconite in the congestive form, and belladonna, stramonium, or hyoscyamus in the spasmodic varieties.

Treatment of the Cause.—Neuralgia.—The treatment of the neuralgic form of dysmenorrhea is considered under the following headings:

Treatment of the systemic condition causing the neuralgia.
General treatment and hygiene.
Drugs.
Removal of the ovaries.

Treatment of the Systemic Condition Causing the Neuralgia.—The treatment is based upon general medical principles and includes the cure of the systemic condition which is responsible for the depraved state of the blood, nervous system, and nutrition, as well as the correction of injurious habits and a change of environment.

General Treatment and Hygiene.—Physical, mental, and sexual rest are important in the management of this form of dysmenorrhea, and the patient should be instructed to take a short nap every afternoon. Systematic exercise in the open air and sunshine must be insisted upon, and a few minutes night and morning devoted to the indoor exercises described on page 117. The bowels must be kept regular and the diet selected to meet the indications in each case. The free use of pure drinking-water is essential in the treatment in order to increase the activity of the kidneys and flush the system. The skin must be kept active and a daily bath given, the character of which should be selected according to the strength of the patient and the general indications. Turkish and Russian baths are very beneficial, and good results are also obtained from hot sitz and full baths. Sea bathing is especially indicated in some cases and should be used in moderation.

Wool should be worn next to the skin and the clothing should not constrict the waist. An abdominal bandage made of flannel adds to the comfort of the patient and protects the viscera from sudden changes of temperature.

Hot-water vaginal douches are beneficial as a routine method of treatment, and should be used not only during the intermenstrual period but also at the time of an attack. Vaginal tampons of cotton-wool saturated with glycerin and ichthyol (25 per cent.) or plain glycerin are useful in the treatment of this form of dysmenorrhea, and should be employed during the intermenstrual periods.

A change of residence is often of benefit, and patients should live temporarily, if possible, in a climate that is suited to their condition. The winter and early spring months in the north are especially unhealthful for these patients, and they should be advised to reside in the south, preferably at one of the seaside resorts of Florida. During the late spring and summer some patients do better in the mountains, and others, again, are decidedly improved by living at the seashore or taking a sea voyage.

Electricity and massage are indicated in the neuralgic form of dysmenorrhea, and in neurasthenic patients good results are often obtained by a "rest cure."

Drugs.—Apiol is very effective in neuralgic dysmenorrhea and is given in capsules of 3 to 5 minims, three times daily after meals for one week before and during the period. Phenacetin or antipyrin in 5-grain doses every half-hour until 30 grains are taken is a good remedy to employ at the time of an attack, and the adminstration of tincture of pulsatilla in 5-drop doses three times daily for one week before the flow usually gives good results. The bromids, especially the sodium salt, are very beneficial, and should be given three times daily for one week before the period, and if necessary continued during the flow. The action of the bromids is increased by combining them with other drugs, and for this purpose valerian, gelsemium, or asafetida is often employed. Tincture of cannabis indica is effective in many cases, and should be given in 20-drop doses every three hours during the attack. Camphor is only useful in mild cases, and may be given in a 2-grain pill every two, three, or four hours during the attack; monobromated camphor in 4- to 5-grain doses is the most efficient preparation. Black haw, Jamaica dogwood, and goldenseal in a combination known as "Liquor Sedans" (Parke, Davis & Co.) are very effective, and are especially indicated if the dysmenorrhea is associated with menorrhagia. This preparation must be given continuously for two or three months, and administered in drachm doses three times daily between meals. Amyl nitrite by inhalation in doses of 3 to 5 minims, or nitroglycerin administered hypodermically (gr. $\frac{1}{100}$), acts very promptly and should be given during the attack. Alcohol, opium, and chloral hydrate are dangerous remedies and are employed only as a last resort. General anesthesia may be employed if the pain is very severe or the patient becomes hysteric, and under these circumstances chloroform is preferable to ether. If a spasmodic condition of the uterine muscle is associated with the neuralgia, the use of belladonna, stramonium, or hyoscyamus, alone or in combination with other remedies, is often followed by good results, and should be given at the time of the attack.

Removal of the Ovaries.—The operation of oöphorectomy has been advised for the relief of pain in cases of obstinate neuralgic dysmenorrhea after other methods of treatment have failed. The removal of the ovaries under these circumstances is a very serious question and should not be lightly considered or thoughtlessly undertaken. These patients, as a rule, are anemic and debilitated, and if the uterine appendages are removed, the stumps are very likely to become irritable and increase the suffering instead of diminishing it. Again, the artificial menopause may produce a profound impression upon the patient's mind and result in serious psychic and physical symptoms.

Diathesis.—The treatment of this form of dysmenorrhea is considered under the following headings:

Treatment of the cause.
General treatment and hygiene.
Drugs.

Treatment of the Cause.—The treatment of the uric acid diathesis, manifesting itself in the form of gout or rheumatism, is necessarily based upon general medical

principles, and need not therefore be considered here. It is important, however, in these cases to insist upon the patient drinking plenty of pure water in order to flush the kidneys and carry off the waste products.

General Treatment and Hygiene.—Success in the management of these cases depends more upon the general treatment and hygiene than upon the use of drugs. These subjects have been fully discussed in a general way on page 723 and will only be referred to again in calling attention to certain essential factors in the treatment.

The bowels must be carefully regulated and the tendency to constipation corrected by exercise and attention to the diet. The occasional use of a saline purge is beneficial, and a bottle of citrate of magnesia taken just before the appearance of menstruation may prevent an attack, or if administered after the flow begins, may lessen the acuteness of the pain. Turkish or Russian baths are especially useful and may be taken two or three times a week. Hot-water vaginal douches given twice daily during the intermenstrual period and at the time of the attack give good results, and a change of residence during the winter and early spring months to a mild climate where outdoor exercise can be taken is essential. Massage and electricity are very useful, and should be employed for their tonic action and influence upon the pelvic circulation.

Drugs.—Salicylate of sodium (gr. x–xxx) or ammoniated tincture of guaiac (♏x–fʒj) given for one week before the menstrual period will often modify the symptoms and prevent the occurrence of the paroxysm.

The following remedies are effective at the time of the attack: apiol, phenacetin, antipyrin, tincture of cannabis indica, amyl nitrite, and nitroglycerin.

Alcohol, chloral hydrate, and opium are dangerous remedies and must be cautiously employed on account of the liability of the patient becoming addicted to their use. Morphin may be administered hypodermically combined with atropin, or the extract of opium may be given with belladonna, stramonium, or hyoscyamus by the rectum in the form of a suppository. A general anesthetic is indicated in cases of severe suffering, and under these circumstances chloroform is preferable to ether.

Pelvic Congestion and Inflammation.—The treatment of dysmenorrhea due to these causes is considered under the following headings:

Treatment of the cause.

Treatment of the attack independent of the cause.

Treatment of the Cause.—This form of dysmenorrhea is due to local lesions, and their treatment is discussed in the chapters devoted to pelvic diseases. The management of congestive dysmenorrhea therefore depends, first, upon a correct diagnosis of the cause; and, second, upon our ability to remove it. In many of these cases the removal of the cause necessitates the extirpation of the uterus or its appendages or both, and under these circumstances the dysmenorrhea is cured because menstruation ceases. Other cases, however, are curable without the necessity of a mutilating operation and causing an artificial menopause.

Treatment of the Attack Independent of the Cause.—The pain at the time of menstruation is usually an exaggeration of that which is felt during the intermenstrual period, and the object of treatment is to lessen as much as possible the congestion caused by the local lesion. Sexual and physical rest must be insisted upon and the bowels kept regular. The occasional use of salines materially lessens the pelvic congestion and relieves the local pain. The clothing must not constrict the abdomen and flannel should be worn next to the skin. Hot-water vaginal douches and cotton-wool tampons saturated with a mixture of glycerin and ichthyol (25 per cent.) used during the intermenstrual period will lessen the local pain and relieve the paroxysm at the time of menstruation. Hot-water

irrigations of the vagina at the time of the attack are also indicated, and should be employed when the pain is severe.

The following remedies are effective during the attack: Apiol, phenacetin, antipyrin, tincture of cannabis indica, amyl nitrite, and nitroglycerin.

The bromids, especially the sodium salt, are indicated in the treatment, and are used during the intermenstrual period with decided benefit.

There is seldom any necessity during the attack to resort to the use of alcohol, chloral, or opium, and the pain is never severe enough to require the administration of a general anesthetic.

Malformed and Undeveloped Genital Organs.—The treatment of dysmenorrhea due to congenital conditions is based upon the recognition of the cause.

Stenosis of the vagina or cervical canal is relieved by forcible dilatation or division of the stricture, and cases of atresia due to an imperforate hymen are overcome by incising the membrane. Complete occlusions require a careful dissection in order to make the canal patulous and provide an outlet for the menstrual discharge.

If the vagina is absent, and the subjective symptoms of menstruation occur or signs of retention show themselves, a permanent opening must be made connecting the vulva with the cervical canal, and the dammed-up menstrual blood allowed to escape.

In cases of imperfect development of the uterus or ovaries little or nothing can be accomplished by treatment except when the organs are late in maturing on account of general debility and want of nerve force. Under these conditions dilatation and curetment of the uterus should be performed in order to stimulate the pelvic organs and increase the flow of blood to the parts. Coexisting constitutional diseases must be treated upon medical principles, and careful attention given to general treatment and hygiene, which includes rest, exercise, diet, care of the bowels, bathing, clothing, change of residence, massage, and the use of electricity.

The employment of drugs in the treatment of dysmenorrhea due to atresia is contraindicated, as the pain is caused by retention of the menstrual blood, and cannot therefore be relieved until the obstruction is removed. In these cases, however, the suffering may be modified and the acuteness of the paroxysm lessened by the hypodermic administration of morphin and atropin.

The following remedies are useful in cases of stenosis and painful molimen due to undeveloped genital organs: Phenacetin, antipyrin, the bromids during the intermenstrual period, tincture of cannabis indica, camphor, monobromated camphor, amyl nitrite, nitroglycerin, belladonna, stramonium, and hyoscyamus.

In rare instances alcohol, opium, or general anesthesia may be indicated.

The removal of the uterine appendages is indicated if the treatment fails to relieve the suffering and the health of the patient is being destroyed.

Obstruction.—The treatment of obstructive dysmenorrhea is considered under the following headings:

Removal of the cause.

Treatment of the attack.

Removal of the Cause.—In cases of anterior flexion the treatment is surgical and consists in dilatation and curetment of the uterus (see p. 955). The dilatation must be done slowly, so that the muscular fibers of the cervix are thoroughly stretched and a laceration prevented. The object of the curetment is to remove the inflamed and swollen endometrium which increases the stenosis at the angle of flexion and forms part of the obstruction. Before completing the operation the uterine cavity is packed tightly with a narrow strip of plain gauze, which is

allowed to remain for forty-eight hours in order to keep up the dilatation and prevent the flexion from recurring. The best time to perform the operation is during the week following menstruation. In some cases the cure is not complete and a second dilatation and curetment may be required. If pregnancy occurs, the cure is permanent. The relief of the symptoms does not occur immediately after operation, and, as a rule, the menstrual pain does not disappear until the second or third period.

A stenosis caused by a small uterine polyp is cured by the removal of the growth, and constrictions of the cervical canal and vagina are relieved by forcible dilatation or a cutting operation. If an obstruction in the vagina has been caused by a syphilitic ulceration, constitutional treatment must first be employed, and later on the caliber of the canal restored by multiple incisions and divulsion.

Exfoliative endometritis or membranous dysmenorrhea is treated by dilatation and curetment of the uterus.

Atresia of the cervix or vagina is treated by a cutting operation and divulsion.

The technic of the various operations is fully described in their respective chapters.

Treatment of the Attack.—In cases of atresia the use of drugs is contraindicated, except the administration of morphin combined with atropin to relieve the acute suffering of retention. In cases of stenosis the following remedies are employed during the attack: Phenacetin, antipyrin, tincture of cannabis indica, amyl nitrite, nitroglycerin, stramonium, belladonna, and hyoscyamus. Opium, chloral, alcohol, or general anesthesia may be imperatively demanded in some cases. Apiol, the bromids, black haw, goldenseal, and Jamaica dogwood are also used during the intermenstrual periods, and continued if necessary while the flow lasts.

In the membranous form of dysmenorrhea excellent results have followed the administration of 30 drops each of the fluid extract of black haw and goldenseal, given twice daily beginning eight days before menstruation and continued during the flow.

The occasional use of salines lessens the pelvic congestion and decreases the severity of the attacks.

CHAPTER XXXIV.

COCCYGODYNIA.

Definition.—A painful affection of the coccyx and the surrounding structures, which is characterized by more or less intense pain upon motion or pressure.

Causes.—The disease is rare in children and in nulliparous women.

The causes may be divided into: (1) the local and (2) the general.

The Local Causes.—The local causes, as a rule, are due to traumatisms, and chief among these are the injuries occasioned by childbirth. As the result of a tedious, difficult, or instrumental labor the coccyx is dislocated or fractured and the bone becomes fixed in an abnormal position, usually at a right angle to the sacrum. Again, the muscles or the ligaments may be strained or torn and a severe and intractable form of the disease result. Sometimes osteitis or necrosis develops and the bone becomes exquisitely tender and painful. An old primipara in whom the coccygeal articulations are rigid and ankylosed is more liable to an injury of the bone during labor than a younger woman in whom all the joints are freely movable.

Coccygodynia may also be caused by various forms of external violence, such as a kick or a blow or falling astride on a narrow object, and, finally, the affection has been occasioned by rough continuous horseback-riding.

The General Causes.—While a coccygodynia due to general causes is comparatively uncommon, yet we not infrequently meet cases in which no appreciable local lesion is present, and where the affection results from rheu-

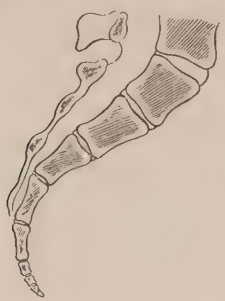


Fig. 632.—Normal Position of the Coccyx.

Fig. 633.—Dislocation of the Coccyx Forward.

matism or neuralgia of the muscles or ligaments surrounding the bone. These patients, as a rule, have a rheumatic or gouty history, and the local pain usually follows exposure to cold or indiscretion in eating or drinking. In rare instances pain in the coccyx is one of the sensory manifestations of neurasthenia.

Symptoms.—Pain in the coccyx and in the adjacent muscles and tendons is the cardinal symptom of coccygodynia. It varies in severity from a dull heavy ache to an intense agonizing pain which is relieved when the patient is at rest and becomes acute again when she makes any form of muscular exertion. The pain is caused by pressure directly on the coccyx or by the contraction of the coccygeal muscles. It occurs, therefore, when the patient sits on a chair, during defecation, coitus, or any sudden movement or jolt, and in some cases the bone is so tender that she is forced to sit upon one buttock. The pain is often very acute, as the patient sits down on or gets up from a chair, and she is frequently unable to rise without help.

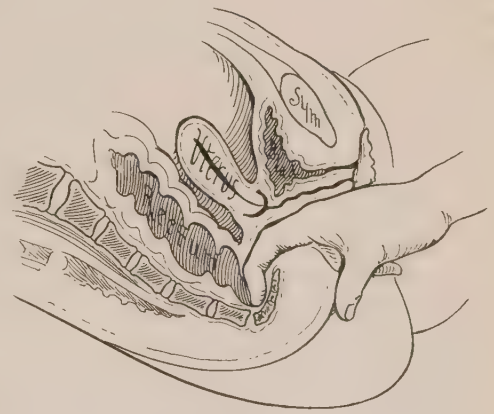


Fig. 634.—Palpation of the Coccyx with the Index-finger in the Rectum.
Showing a forward dislocation of the bone.

Diagnosis.—The diagnosis is based upon the recognition of the cause. If the physical examination reveals no local lesion, we should search for one of the general causes.

Examination.—The patient is placed in the left lateral-prone position and the index-finger of the right hand introduced into the rectum. The anterior and lateral surfaces of the coccyx are then palpated with the tip of the finger and any abnormal change in its shape, size, or sensitiveness noted.

The thumb is now placed externally over the coccyx and the bone grasped

between it and the internal finger. The coccyx is then moved backward and forward to test its mobility and to ascertain the presence of tenderness as well as to elicit any evidence of a fracture or dislocation.

Necrosis of the coccyx is recognized by probing the sinus which is connected with the diseased bone.

Differential Diagnosis.—The affection must be distinguished from vaginismus, hemorrhoids, and anal fissure by a physical examination.

Prognosis.—The prognosis depends upon the cause. When the disease is due to a local lesion, it can be quickly and permanently relieved by appropriate treatment; but when it results from general causes, the prognosis should be guarded, as it is often difficult to remove the rheumatic or gouty tendency or to cure a well-marked case of neurasthenia.

Treatment.—The treatment of coccygodynia is based upon the cause, and it is therefore important to ascertain in every case whether the affection is due to a local lesion or to general causes. The treatment of the former is always surgical, while the latter is managed according to general medical principles. No form of treatment

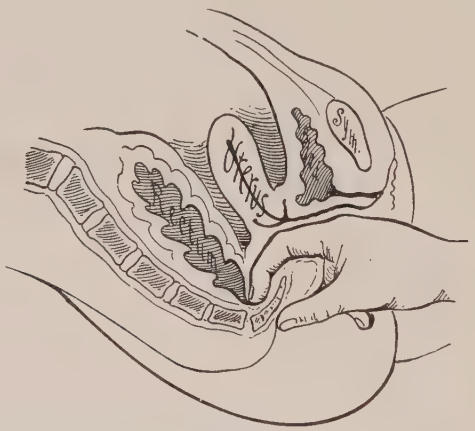


FIG. 635.—PALPATION OF THE COCCYX WITH THE INDEX-FINGER IN THE RECTUM AND THE THUMB EXTERNALLY.

should be instituted until a thorough physical examination of the coccyx has been made, otherwise the symptoms may be attributed to a general cause when they are local in origin. I have removed the coccyx several times in neurasthenic women in whom no examination had been made, as the local symptoms were attributed to the general condition of the system, and the treatment carried out accordingly for several years without results. In all of these cases the coccyx had been fractured during confinement and union had taken place with the bone in a distorted position.

The treatment of the affection is classified as follows:

The surgical treatment of the local causes.

The medical treatment of the general causes.

The Surgical Treatment of the Local Causes.—Coccygectomy, or the removal of the coccyx, is the operation indicated in these cases, and it should be resorted to without delay when the affection is due to a local lesion.

Technic of the Operation.—*Preparation of the Patient.*—A bottle of citrate of magnesia should be given the night before the operation, followed

next morning by an enema of soapsuds and warm water, and the bladder should be emptied spontaneously just prior to the administration of the anesthetic. On the morning of the operation the patient should be given a full warm bath and thoroughly scrubbed with soap. After getting out of the bath the vagina and vulva should be irrigated with a solution of corrosive sublimate (1 to 2000), followed by sterile water, and the gluteal cleft, the perineum, the anal region, and the buttocks carefully sterilized as follows: Scrub them with a gauze sponge saturated in liquid soap and water and then douche with a solution of corrosive sublimate (1 to 2000), which in turn is removed with sterile water. The parts are

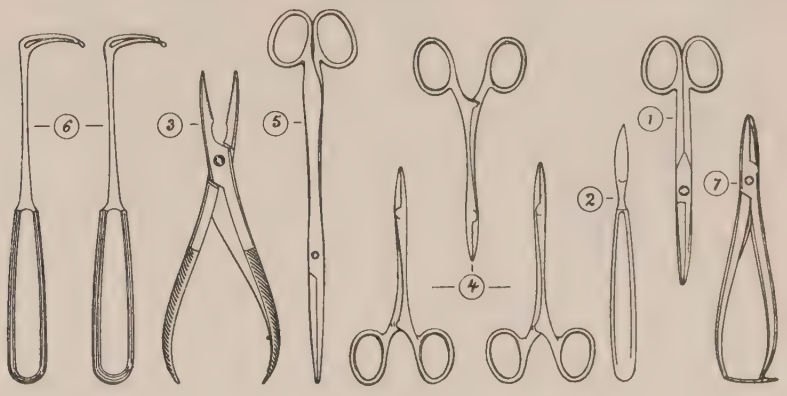


FIG. 636.—INSTRUMENTS USED IN COCCYGECTOMY.

then dried with a towel and a large gauze compress secured with a T-bandage is placed between the buttocks and the legs and thighs protected with canton flannel stockings. The hips and lower extremities are finally wrapped in a sterile sheet which is secured on the right side by safety-pins.

Position of the Patient.—Left lateral-prone position.

Final Sterilization of the Parts.—After the patient is thoroughly under the influence of the anesthetic she is placed in the proper position, and the nurse then unfastens the safety-pins and throws the sheet off from the hips and lower extremities. The gauze compress and T-bandage are now removed and the operator scrubs the gluteal cleft with liquid soap and warm water and douches the parts with a solution of corrosive sublimate (1 to 1000), which in turn is removed with sterile water. The parts are then dried and towels are placed above, below, and at the sides of the field of operation and secured with safety-pins.

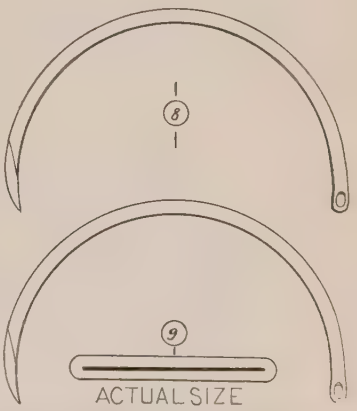


FIG. 637.—NEEDLES AND SUTURE MATERIAL USED IN COCCYGECTOMY.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse are required.

Dressings; Sponges; Towels; etc.—See page 832.

Instruments.—(1) A pair of straight blunt-pointed scissors; (2) scalpel; (3) a pair of bone-holding forceps; (4) three short hemostatic forceps; (5) dressing

forceps; (6) two retractors; (7) needle-holder; (8) two full-curved Hagedorn needles; (9) silkworm-gut—20 strands.

Operation.—First Step.—A free incision is made down to the coccyx and the entire length of the bone exposed.

Second Step.—The tip of the coccyx is freed by severing its attachments with

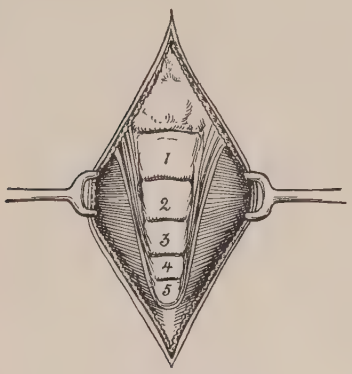


Fig. 638.—First Step.

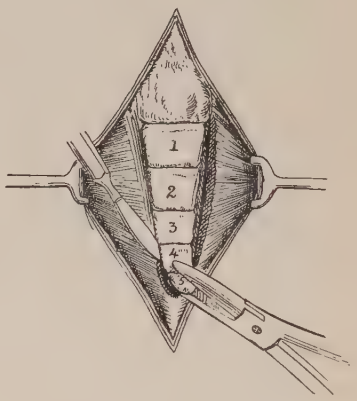


Fig. 639.—Second Step.

Coccygectomy.

the scalpel. It is then grasped by the bone-holding forceps and pulled forward and the lateral structures which are thus put upon the stretch divided up to the sacrococcygeal articulation.

Third Step.—The anterior attachments are severed with scissors and the sacrococcygeal articulation divided with the scalpel.

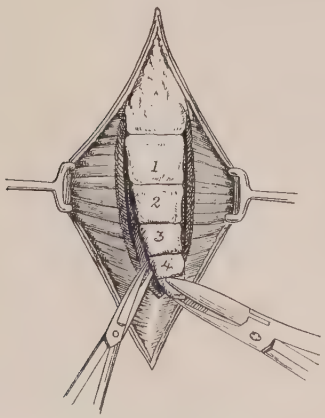


Fig. 640.—Third Step.

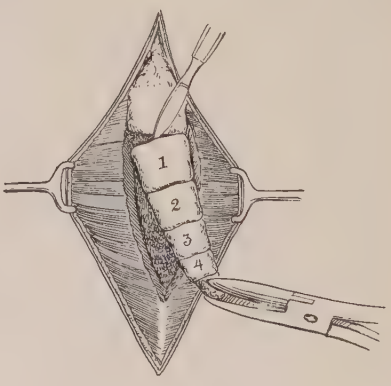


Fig. 641.—Third Step.

Coccygectomy.

It is always best to disarticulate the joint and not to cut the coccyx away with bone forceps, as the end of the sacrum may be injured and necrosis result.

Fourth Step.—The wound is closed with deep interrupted silkworm-gut sutures and drained with a few strands of the same suture material.

A full-curved Hagedorn needle should be used for introducing the sutures,

which are passed through the skin about one-quarter of an inch from the edge of the incision and are then carried completely buried under the bottom of the wound, emerging through the skin on the opposite side.

The introduction of the sutures is greatly facilitated by having the assistant place his index-finger in the rectum and push up the bottom of the wound, which is always very deep and difficult to close unless it is made shallow in this way.

The strands of silkworm-gut which are used for drainage are placed along the bottom of the wound and their free ends carried out at the upper and lower angles of the incision.

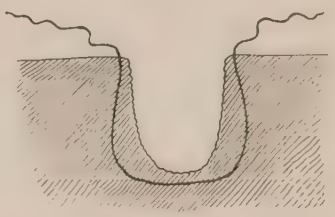


Fig. 642.—Coccygectomy—**Fourth Step.**

Method of introducing the sutures in closing the wound. Note that the sutures are carried completely under the bottom of the wound.

Fifth Step.—After tying the sutures a compress of gauze is placed over the incision and held securely in position with a T-bandage.

Variations in the Technic.—Some operators leave the wound open and allow it to heal by granulation. This is not a good method, as the healing process is exceedingly slow and troublesome, owing to the great depth of the wound and the frequent occurrence of infection taking place from the rectum. Others, again, close the wound without drainage. This is also, in my judgment, a bad method, as the bottom of the wound is very likely to become infected on account of its close proximity to the rectum if a small accumulation of serum occurs in a pocket resulting from an imperfect

Fig. 643.—Coccygectomy—Decreasing the Depth of the Wound before Introducing the Sutures—**Fourth Step.**

Diagram *a* shows the bottom of the wound pushed up by the finger in the rectum; diagram *b* shows the natural depth of the wound after the removal of the coccyx.

approximation of its edges. Under these circumstances all the stitches must be removed and the wound packed with gauze and allowed to heal by granulation. On the other hand, draining the wound for forty-eight hours removes this danger and primary union usually results.

After-treatment.—*Care of the Wound.*—The wound should be

washed daily with a solution of corrosive sublimate (1 to 1000) and a clean compress and T-bandage applied. If any evidence of inflammation or suppuration occurs, the stitches should be removed at once and the wound packed with gauze.

The silkworm-gut drain should be removed in forty-eight hours if the dressings are dry and there are no indications for keeping up the drainage. In removing the silkworm-gut care must be taken not to infect the bottom of the wound. To prevent this, the strands at the upper angle of the incision are pulled out about a quarter of an inch and then cut off close to the surface of the skin. The lower strands are now grasped by the fingers and the entire drain pulled out of the wound. The sutures are removed on the eighth day.

The Bladder.—For the first three or four days the bladder should be emptied every eight hours with a catheter in order to keep the wound clean and prevent infection.

The Bowels.—For the same reasons the bowels should not be moved until the fourth day.

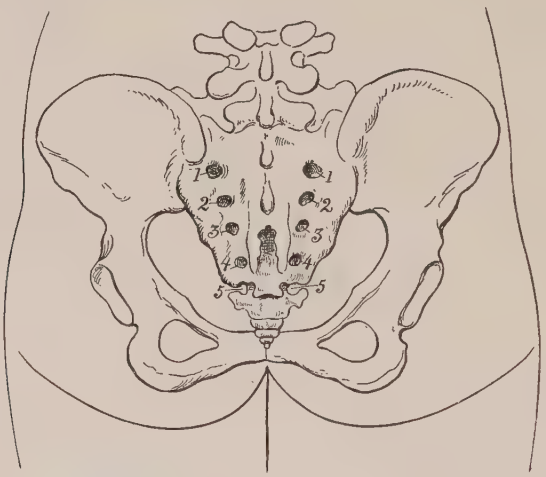


FIG. 644.—SHOWS THE POINTS OF EMERGENCE OF THE FIVE POSTERIOR SACRAL NERVES.

The Diet.—During the first twenty-four hours liquid diet (see p. 106) should be given and then the patient should be placed upon convalescent diet (see p. 114).

Restlessness and Pain.—As a rule, there is no occasion for the use of drugs. A hypodermic injection of morphin (gr. $\frac{1}{8}$) may be used during the first twenty-four hours if there is much pain, or restlessness and sleeplessness may be controlled with bromid of sodium, sulphonal, or trional.

Getting Out of Bed.—The patient should remain in bed for ten days. There is no necessity for her to remain in bed longer than this period, even if suppuration takes place and the wound is packed with gauze, as the dressings are readily held in position by strips of zinc oxid plaster.

Persistence of the Local Pain.—Sometimes the pain in the coccygeal region persists with more or less severity after the coccyx has been removed and the patient has recovered from the effects of the operation. Under these circumstances a complete cure can be effected by cauterizing the posterior sacral nerves as they emerge from the posterior sacral foramina (Fig. 644). To accomplish this, a narrow strip is burnt deeply over the skin with a Paquelin cautery or a hot iron

from the base of the coccyx on each side upward along the course of the sacral foramina; the eschar is then treated as an ordinary granulating wound.

The Medical Treatment of the General Causes.—The medical treatment is divided into:

The systemic treatment.
The local treatment.

The Systemic Treatment.—This consists in treating the rheumatic or gouty condition or the neurasthenia according to general medical principles.

The Local Treatment.—This form of treatment is not intended in any way to take the place of the systemic management of the disease, but is simply employed as a means to control or lessen the coccygeal pain while the general cause or causes are being removed.

The following local remedies are recommended: (1) Aquapuncture, (2) suppositories, (3) ointments, (4) electricity, (5) blisters, and (6) cauterization.

Aquapuncture.—This method consists in injecting sterile water under the skin with a hypodermic needle over the seat of pain in the coccyx and the adjacent parts. The local tension, which is followed by the absorption of the water, seems to lessen the acuteness of the pain by in some way modifying the local chemic action.

Suppositories.—Suppositories of belladonna (gr. ½) or iodoform (gr. v–x) have sometimes been used with good results.

Ointments.—An ointment rubbed into the skin over the coccygeal region may sometimes stop the pain or lessen its severity and give the patient more or less permanent relief. Veratrine ointment (U. S. P.) is very useful for this purpose and should be reduced in strength by adding an equal quantity of lanolin. As veratrine is very irritating to mucous membranes, care should be taken not to smear any of the ointment over the anus. Aconite also acts beneficially in these cases in the form of an ointment either alone or combined with belladonna.

The following formula will be found very efficacious:

℞. Tincturæ aconiti, ... f℥ss
Unguenti belladonnæ, ... ℥j
M. et ft. unguentum.

Electricity.—The galvanic or faradic current may be applied directly over the coccygeal region as an adjunct to other methods of local treatment; it has been found of advantage in some cases.

Blisters.—A fly blister is one of the best remedies we have at our command to control the coccygeal pain, and it should always be employed when the milder methods fail to give relief. A blister half an inch wide should be placed directly over the posterior sacral foramina from the base of the coccyx on each side to above the first sacral foramen. In this position the blisters act directly on the posterior sacral nerves as they emerge from the foramina (Fig. 644).

Cauterization.—The actual cautery is by far the most certain remedy we possess to control the coccygeal pain, and it should be tried when other methods fail. In neurasthenic cases and in rheumatic or gouty women I know of no local treatment that can compare with cauterization in its results; in my hands it has often permanently cured the pain and assisted materially in restoring the health of these patients.

The cautery should be applied directly over the posterior sacral nerves as they emerge from the sacral foramina. To accomplish this, a narrow strip is burnt deeply over the skin from the base of the coccyx on each side upward along the

course of the sacral foramina (Fig. 644). A Paquelin cautery or a hot iron with a narrow point may be used to cauterize the skin, and the eschar is treated as an ordinary granulating wound.

CHAPTER XXXV.

TUBERCULOSIS OF THE GENITAL ORGANS.

Causes.—Tuberculosis of the female organs of generation is a comparatively frequent disease which may occur either as a *primary* or as a *secondary* infection. While the largest number of cases are secondary to a tuberculous area in some other part of the body, yet we not infrequently meet a primary localization of the disease in the genital organs.

Secondary involvement of the genital tract may take place as follows:

(A) By direct extension from adjacent structures.
(B) From remote organs through the blood and lymphatic vessels.
(C) From distant abdominal organs through the peritoneum.
(D) From tuberculous excretions and discharges carried to the genital organs by the hands of the patient herself.

(A) Direct extension of the disease may occur from areas of infection in adjacent structures. Thus, the ovaries, the tubes, or the uterus may become secondarily involved in tuberculous peritonitis, which is a very common origin of genital tuberculosis. Again, adhesions may occur between a tuberculous intestine and the pelvic organs, and later when ulceration takes place the bacilli gain access at the point of contact. And, finally, extension of the disease from the urinary to the genital organs has also been observed in a number of cases.

(B) It is probable that the blood and lymphatic vessels may be the channels through which the bacilli sometimes find their way from distant areas of infection to the pelvic structures. That this is possible is shown by the fact that many women who die of pulmonary phthisis have also genital tuberculosis without any evidence, upon postmortem examination, of the contents of the abdomen being involved.

(C) According to Williams, the "tubercle bacilli from the surface of intestinal ulcers or from other tuberculous abdominal organs may find their way into the peritoneal cavity, and fall to its lowest part, the pelvic cavity, without giving rise to tuberculous peritonitis; and from there they may be wafted into the tubes by the currents produced by the action of their cilia, and, if they meet with suitable conditions, may lead to their infection."

(D) Women who have pulmonary phthisis or tuberculosis of the intestines and urinary apparatus may infect the genital organs with their hands if they become soiled by the expectoration from the lungs or by the discharges from the rectum and bladder.

Primary tuberculosis of the genital organs may result from causes external to the patient's body. Thus, the bacilli may be conveyed to the organs of generation of a perfectly healthy woman during sexual intercourse with a man who has tuberculosis of the genito-urinary or intestinal tract. In the same way inoculation may occur from the use of infected instruments and from douching the vagina with a syringe belonging to a tuberculous woman. The disease may also be transmitted from one patient to another by the examining finger of the attending physician if he is careless in his methods of personal sterilization. And, finally,

the contact of infected clothing with the vulva may result in direct inoculation of the parts.

Tuberculosis of the genital organs may occur during any period of life, and cases have been observed in very young infants and in very old women; the largest number of infections, however, are met between twenty and forty years of age.

Tuberculosis does not attack all portions of the genital tract with equal frequency, for the reason, probably, that some of the organs are more exposed than others, and we therefore find from experience that the oviducts are infected in the largest number of cases. The uterus is next involved in order of frequency, and then the ovaries, the vagina, and the cervix, and, finally, the vulva, which is, however, very rarely the seat of tuberculous inoculation.

Prognosis.—Tuberculosis of the genital organs is always a grave affection. If the lesion is primary, the danger of other organs becoming infected is constantly present; and if it is secondary, the patient's life is still further jeopardized by the extension of the disease.

A complete recovery often results from extirpation of a localized area of infection, and although spontaneous cures are extremely uncommon, yet they have been known to occur in tuberculosis of the genitalia. The *x*-rays have a decidedly curative effect upon the disease when it is limited to the vulva or vagina. When the affection occurs during the puerperal state, it runs a rapid course and usually ends fatally in a short time.

THE VULVA.

Synonyms.—Lupus vulgaris; Tubercular vulvitis.

Symptoms.—On the skin portions of the vulva the "disease commences with the appearance of many small discrete or grouped, reddish, brownish, or yellowish-red spots, from the size of a pin's head to that of a pea or a bean, deeply seated in the true skin. These well-defined spots, situated beneath the epidermis, through which their color is observable, give to the skin a punctated appearance. In the early stages of the disease they are not sensible to the touch, which merely causes them to assume a lighter color. In the course of some months they slowly increase in size, and gradually approach the surface of the skin, until finally they become evident as papules and tubercles, in appearance and by palpation. They usually present themselves in large numbers and of sizes within the range already indicated. Their color is brownish-red, with surfaces, either rough or smooth, sometimes more or less covered with shiny, whitish epidermis. The papules and tubercles may be either soft or firm to the touch and are not painful. The lesions may, at this stage, remain discrete, or unite and form flat or prominent infiltrations of greater or lesser extent, usually of a circular or serpentine form. Having reached this stage of development, the lesions, sooner or later, undergo either absorption, leaving behind a desquamating and more or less atrophied skin, or else disintegration and ulceration of the infiltrated skin occur. The lupoid ulcerations, which are painless, may be superficial or deep, and in appearance are usually flat, rounded or irregular, with reddish, soft, but well-defined margins. There may be a moderate purulent secretion, with crusting, and when the base of an ulcer is exposed it is red, smooth, or covered with granulations and easily bleeds. During the course of the ulceration, or as healing begins, papillary outgrowths may occur, followed by more or less warty, cicatricial tissue. * * * * * The affection, however, frequently presents at the same time several kinds of lesions—that is to say, the same region may present various phases of evolution and involution of the

malady. The disease, under such circumstances, presents a most striking and characteristic appearance, there being often, at one point, the small primary spots, at another papules and tubercles unchanged or else undergoing the process of absorption or ulceration, with here and there scales, crusts, exuberant granulations, cicatricially atrophied spots, commingled with areas of unaffected skin." (John V. Shoemaker.)

On the mucous membrane portions of the vulva lupus "is not very apparent in the early stage of the disease, as there is no evidence of its presence in the peculiar eruptive spots, as in the case of the skin. The mucous membrane first attracts attention through the fact of its being reddened with spots about the size of a pin's head, somewhat prominent, and closely packed together. The spot may be firm to the touch, excoriated, easily bleeding, and appear at different points, of a silvery-gray color. Later the patch may become more irregular and the color more gray or opaque. The thickened epithelium desquamating, there is left an inflamed superficial or else a deep-fissured or an ulcerated surface. Gradually these conditions disappear, and there remain simply scars that may have a shining and silvery-gray appearance. On the other hand, the patch may be depressed, from being bound down to the underlying tissue, or secondary inflammatory infiltration may develop, leading to suppuration, abscesses, and ulceration of the part, attended with cicatrization. The destructive action of the disease, therefore, occasions unsightly scars and considerable deformity." (John V. Shoemaker.)

In some cases the ulcerative processes in this disease are very destructive, and fistulous openings are formed into the rectum and vagina or even into the urethra. The subsequent cicatrization which takes place in these ulcerated areas causes more or less contraction of the tissues and the development later on of annoying strictures.

The disease develops slowly and is exceedingly chronic in its course. The general health, as a rule, is not affected even in cases where the trouble has existed for a long time.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The microscopic examination.
Animal inoculations.

The History.—The chronic course of the disease and the fact that the general health of the individual is good notwithstanding the long and persistent presence of the lesions are strongly in favor of the condition being lupus. The history shows a very slow development of the malady and but little, if any, pain is complained of by the patient.

The Symptoms.—The character and grouping of the lesions are very significant. Thus, we may observe "at one point, the small primary spots, at another papules and tubercles unchanged, or else undergoing the process of absorption or ulceration, with here and there scales, crusts, exuberant granulations, cicatricially atrophied spots, commingled with areas of unaffected skin." With this group of lesions there should be but little difficulty in making the diagnosis, especially when the vulva is deformed and contorted by unsightly cicatrices. The disease is not usually associated with tuberculous infection of other genital organs.

The Microscopic Examination.—A positive diagnosis can only be made by means of the microscope.

Technic.—No preparatory treatment is necessary. The patient is put under the influence of an anesthetic and placed in the dorsal position. The

vulva is now gently washed with warm water and soap and a douche of hot normal salt solution is given to cleanse the parts.

The suspected area is then seized with tissue forceps and a small piece excised with a scalpel or scissors. The specimen is at once placed in a 10 per cent. solution of formalin and sent to a pathologist for examination.

The raw surfaces are brought together with one or two catgut sutures and the wound dressed with iodoform gauze.

Animal Inoculations.—The secretions should be collected (see p. 45) and sent to a pathologist, who should examine them for the presence of tubercle bacilli and make animal inoculations.

Differential Diagnosis.—The disease must be distinguished from syphilis and carcinoma of the vulva.

In syphilis the inguinal glands are involved, there is a single area of ulceration, and specific treatment gives positive results. In tuberculosis, on the other hand, the inguinal glands are seldom involved, the ulceration is multiple, and the results of specific treatment are negative.

Tuberculosis.	Carcinoma.
Very slow in development.	Not so slow.
Several nodules.	Single nodule.
Ulceration superficial.	Usually deep.
Margins of ulcer not everted.	Everted and undermined.
Margins of ulcer slightly infiltrated.	Marked infiltration.
Surface covered with bright red granulations.	Surface fungoid in appearance.
Tendency to repair ending with cicatrices.	No formation of cicatrices.
Rarely affects general health.	Cachexia.

Prognosis.—The course of the disease is very chronic, often extending over a period of many years without affecting the patient's health; in some cases, however, it ends fatally from associated pulmonary phthisis.

The lesions are difficult to cure and yield very slowly to treatment. Relapses are common and often occur after the apparent restoration of the tissues to a normal condition. The disease is apt to cause unsightly deformities from cicatricial contractions.

Treatment.—The treatment is divided into: (1) the operative; (2) the local; (3) the general; and (4) the use of the *x*-rays.

The Operative Treatment.—The operative methods are: (*a*) Total excision; (*b*) curetment; and (*c*) cauterization.

Total Excision.—The looseness of the vulvar structures permits an extensive removal of the tissues without subsequent tension upon the sutures when the wound is closed, and hence there need be no hesitancy in making the incision large enough to completely eradicate the diseased area.

Whenever the disease is limited to the vulva, the radical operation of excision is absolutely indicated. In cases where the lesion only involves a small area it should be excised, along with enough of the surrounding healthy tissue to insure complete eradication of the disease, and the wound closed with catgut sutures and dressed with a gauze compress. Should the vulva, however, be extensively infected, it should be entirely removed. The technic of Excision of the Vulva is described on page 963.

Curetment.—When the disease not only involves the vulva, but also the skin of the surrounding parts, the operation of curetment should be performed, and repeated as often as the lesions reappear.

The infected spots should be thoroughly scraped with a sharp curet and douched with a solution of corrosive sublimate (1 to 2000) and dressed with

iodoform gauze held in position with a T-bandage. The vulva should be douched with a solution of corrosive sublimate and fresh dressings applied once a day.

Cauterization.—This operation has the same indications and limitations as curetment. It consists in the application of the actual cautery or nitric acid to the infected spots, which is followed by a douche of corrosive sublimate (1 to 2000) and a dressing of iodoform gauze held in position by a T-bandage. Sometimes it may be advisable to scrape the diseased surfaces with a sharp curet before using the cautery, in order to remove the surface of the lesions.

The Local Treatment.—The local remedies which seem to have a curative effect upon the lesions of lupus are iodoform, tincture of iodin, and lactic acid. If iodoform is employed, the vulva should be dusted with the powder two or three times daily and a lint compress worn; or tincture of iodin or lactic acid may be painted over the diseased areas twice a week.

The General Treatment.—This is conducted upon the same general medical principles as the treatment of tuberculosis in other parts of the body.

The Use of the *x*-rays.—The *x*-rays should always be employed, either alone or in connection with operative or local medicinal measures, in every case of tuberculosis of the vulva.

This subject is considered on page 76.

THE VAGINA.

Frequency.—Tuberculosis of the vagina is a comparatively rare disease on account of the resistance that the vaginal epithelium offers to the invasion of pathogenic germs. When, however, the mucous membrane becomes abraded or eroded as the result of injury or of maceration from retained secretions, these organisms find little or no difficulty in attacking the vagina and causing inoculation.

Methods of Infection.—The disease is usually secondary to tuberculosis of the uterus or oviducts, and is due to the inoculation of the vagina by the infected secretions from these organs. In some cases, however, tubercular abscesses occurring in the rectum, the intestines, or the bladder may rupture into the vagina and cause infection. The disease has also been observed as a secondary manifestation of tuberculosis in cases of pulmonary phthisis. And, finally, while primary involvement of the vagina is very rare, cases have occasionally been met where it was impossible to discover any other area of infection in the body.

Symptoms.—The lesions are usually situated in the posterior wall of the vagina, and involve, as a rule, only the upper third of the canal and the culdesac behind the cervix. This is the most dependent portion of the vagina, and hence the infected tubal and uterine secretions collect there, macerate the epithelium, and cause inoculation. In cases of primary tuberculosis, if the tubercle bacilli are introduced from outside sources, the lower third of the vagina and the vulvovaginal orifice are involved, while the upper portion of the canal generally remains free from infection.

The disease first appears in the form of miliary tubercles, which eventually become converted into yellowish-gray masses of cheesy matter that break down and develop into ulcers. The ulcers are irregular in shape and shallow, and their margins are clearly defined. The floor of each ulcer is covered with granulations, which are more or less hidden from view by a layer of cheesy matter, and surrounding the ulcerated spot is a hyperemic area that is studded with miliary tubercles.

In some cases the ulceration may become extensive and involve the deeper

structures and form fistulous openings between the vagina and the peritoneum, the bladder, or the rectum.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The microscopic examination.
Animal inoculations.

The History.—The chronic course of the disease and the existence of a tuberculous infection in a remote organ of the body are strongly in favor of vaginal tuberculosis.

The Symptoms.—The character of the lesions and their situation in the vagina are very significant. The fact also that the disease is so generally associated with tuberculosis of the uterus and the oviducts will aid materially in arriving at a correct conclusion as to the nature of the affection.

The Microscopic Examination.—A positive opinion depends upon the microscopic findings in an excised piece of the suspected area.

Technic.—No preparatory treatment is required. The patient is put under the influence of an anesthetic and placed in the dorsal position. The vagina is then cleansed with a douche of hot normal salt solution, the perineal retractor introduced, and the canal dried. The suspected area is now seized with bullet forceps, lifted up, and excised with curved scissors. The wound is finally closed with one or two catgut sutures and the vagina tightly packed with iodoform gauze; the patient is allowed to get out of bed on the following morning. The gauze packing should be changed daily for one week and the vagina irrigated at the same time with corrosive sublimate (1 to 2000), followed by normal salt solution.

The specimen is placed at once in a 10 per cent. solution of formalin and sent to a pathologist for examination.

Animal Inoculations.—The secretions should be collected (see p. 45) and sent to a pathologist, who should examine them for the presence of tubercle bacilli and make animal inoculations.

Differential Diagnosis.—The disease must be distinguished from:

Chancre.
Carcinoma.
Granular vaginitis.

Chancre.—The history of the case; the absence of miliary tubercles and other characteristic lesions of tuberculosis; and the rapid course of the disease are sufficient to clear up any doubtful points in the diagnosis.

Carcinoma.—The disease is more rapid in its course; there is usually only a single nodule that breaks down and ulcerates; the ulceration is deeper and more destructive; the ulcer has everted and undermined margins and its base is fungoid in appearance; and there are none of the characteristic lesions of tuberculous infection in other parts of the vagina.

Granular Vaginitis.—The disease is far more frequent than tuberculosis; it is usually associated with gonorrhea or pregnancy; the granulations show no tendency to ulcerate; and there is no evidence of tuberculous infections in other parts of the body.

Prognosis.—Secondary tuberculosis of the vagina is a very grave disease, not only on account of its situation, which makes it difficult or impossible to excise all of the tuberculous tissues, but also because it still further adds to the dangers already existing from the primary source of infection. The prognosis of the primary variety is less serious and the disease may be eradicated in some instances by treatment.

Treatment.—The treatment is divided into: (1) The operative; (2) the local; (3) the general; and (4) the use of the *x*-rays.

The Operative Treatment.—The operative methods are: (*a*) Total excision; (*b*) curetment; and (*c*) cauterization.

Total Excision.—This method of treatment is only indicated in cases of primary infection of the vagina where no other organs are affected. Where the uterus, the oviducts, or other organs are involved, no radical plan of treatment should be instituted.

In suitable cases the diseased area should be excised, the wound closed with catgut sutures, and the vagina packed with iodoform gauze. The post-operative treatment is the same as in other plastic operations upon the vagina.

Curetment.—This procedure is indicated in cases of secondary tuberculosis of the vagina.

The diseased area is thoroughly cureted with a sharp curet and the vagina douched with a solution of corrosive sublimate (1 to 2000) and dried. A tampon of iodoform gauze is then introduced and reapplied daily, using at the same time the vaginal douche of corrosive sublimate to sterilize the parts.

Cauterization.—See cauterization in the treatment of tuberculosis of the vulva on page 742.

The Local Treatment.—See tuberculosis of the vulva (p. 742).

The General Treatment.—This is based upon general medical principles.

The Use of the x-rays.—See tuberculosis of the vulva (p. 742).

THE CERVIX.

Frequency.—The affection is a very rare one and is usually associated with tuberculosis of the vagina. In exceptional cases the body of the uterus may be involved, but, as a rule, the disease is limited to the cervix and does not extend beyond the internal os. Cases of primary tuberculosis of the cervix have been observed in which no area of infection could be discovered elsewhere, and the disease has also been met as the only manifestation of secondary extension in pulmonary phthisis.

Symptoms.—The disease begins either upon the vaginal portion of the cervix or within the cervical canal and appears in the form of miliary tubercles which eventually break down and develop into tuberculous ulcers.

Beginning in the cervical canal, the disease manifests itself at first as an endocervicitis which is accompanied by the usual discharge from the cervix. Later on, as the tubercles develop and break down, the cervix increases in size and the secretion becomes purulent. Uterine hemorrhage may occasionally occur, and, finally, if the disease extends beyond the external os uteri, the characteristic tuberculous ulceration appears upon the vaginal portion of the cervix.

If the disease begins upon the vaginal aspect of the cervix, the lesions are similar to those of tuberculosis of the vagina.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The microscopic examination.
Animal inoculations.

The History.—The chronic nature of the disease and the existence of a tuberculous infection elsewhere in the body point to tuberculosis of the cervix.

The Symptoms.—The cervical discharge, the uterine hemorrhages, and the increased size of the cervix are of no diagnostic value unless the disease has extended beyond the external os and the characteristic ulceration is exposed to view.

When the disease begins upon the vaginal aspect of the cervix the nature of the lesions may be determined by a speculum examination.

The Microscopic Examination.—A positive diagnosis depends upon a microscopic examination of the uterine discharges and an excised piece of the cervix (see pp. 38, 42, and 45).

Animal Inoculations.—Some of the secretions should be used by the pathologist to make animal inoculations in order to confirm the diagnosis.

Differential Diagnosis.—The disease must be distinguished from cancer of the cervix. The similarity in the appearance of the lesions in the two affections is sometimes so marked that it is necessary to base the diagnosis entirely upon the microscopic findings.

Treatment.—If the disease is primary and limited to the cervix, an amputation should be performed (for technic, see p. 459). But where it also involves the body of the uterus, a complete hysterectomy with the removal of the tubes and ovaries is indicated.

In cases which are secondary to an infected focus in a remote organ, or where the local disease is so extensive that extirpation is out of the question, the treatment should consist of curetment, cauterization, local medicinal measures, and the use of the *x*-rays as recommended in tuberculosis of the vagina and vulva.

THE UTERUS.

Description.—The disease may occur either as a *primary* or *secondary* condition. The former is very rare, and is caused by direct infection from outside sources. Secondary tuberculosis of the uterus, however, is not an infrequent disease, and is most often met in connection with tubercular infection of the oviducts. It is also found in women suffering with pulmonary phthisis, and it may occasionally occur as a manifestation of general tuberculosis. The disease is usually limited to the body of the uterus and shows no tendency to extend beyond the internal os uteri. The mucous membrane alone is infected in the beginning of the disease, and it is not until the later stages of the affection that the muscular coat of the uterus becomes involved.

Varieties.—Tuberculosis of the body of the uterus occurs in three forms as follows:

Miliary tuberculosis.
Chronic diffuse tuberculosis.
Chronic fibroid tuberculosis.

Miliary Tuberculosis.—This form of the disease is seldom met except at autopsies; it is usually associated with general miliary tuberculosis, and is also, in all probability, the primary lesion in the other varieties of the affection. The tubercles which are deposited in the mucous membrane eventually undergo caseous degeneration, break down, and form irregularly shaped ulcers which are similar to those observed in tuberculosis of the cervix and the vagina.

Chronic Diffuse Tuberculosis.—This is the most common form of the disease, and is generally known as *caseous endometritis*. The affection begins in the form of miliary tubercles deposited in the endometrium, which finally break down into irregularly shaped ulcers covered with caseous material. Sooner or later the entire mucous lining becomes involved and the uterine cavity is filled with cheesy matter. The disease does not extend into the cervical canal, but in some cases the internal os becomes closed and the condition known as *pyometra* results. In time the muscular coat of the uterus becomes affected and the organ increases in size. As the disease progresses the uterine walls become degenerated and softened and a rupture is likely to occur.

Chronic Fibroid Tuberculosis.—This is the rarest form of uterine tuberculosis and it has only been observed at autopsies.

Symptoms.—The disease is very chronic in its course and is usually associated with symptoms of tubercular infection in adjacent or remote organs of the body. Endometritis is the most prominent and constant local condition, but unfortunately there is nothing during the early stages of the affection in the character of the discharge to distinguish it from a leukorrhea due to one of the simple forms of inflammation which are so constantly met. Later on, however, after the disease has become well advanced our attention may be directed to the nature of the trouble by the cheesy matter that is often found mixed with the uterine discharge.

Diagnosis.—The diagnosis is made as follows:

The history.
The symptoms.
The microscopic examination.
Animal inoculations.

The History.—The chronic course of the disease and the evidence of a general or local infection are strongly in favor of the affection being tubercular. Again, in cases of primary tuberculosis of the uterus the nature of the disease may be suspected if the husband is found to be suffering from any form of tubercular infection.

The Symptoms.—The symptoms are of no diagnostic value unless the uterine discharge contains cheesy material or the physical examination demonstrates the presence of tuberculosis in remote or adjacent organs. The gross changes in the uterus itself are not characteristic of tuberculosis, and are therefore of no diagnostic value when considered alone; but where they exist in connection with infected areas in adjacent or remote structures of the body, or with a leukorrheal discharge containing cheesy matter, or they develop in a woman with a tubercular husband, they then become important links in the chain of evidence.

In the advanced stages of the disease the uterus is enlarged and the walls softer than normal. When atresia develops at the internal os and the secretions cannot escape from the uterine cavity, the organ becomes distended and forms a fluctuating tumor (*pyometra*) which is readily felt by the examining fingers.

The Microscopic Examination.—The diagnosis should always be confirmed by cureting the uterine cavity and examining the scrapings and secretions with the microscope.

Animal Inoculations.—The pathologist should make animal inoculations with some of the secretions sent to him by the surgeon.

Differential Diagnosis.—The disease must be distinguished from non-tubercular endometritis and carcinoma.

Non-tubercular Endometritis.—Tuberculosis of the uterus in its early stages cannot be distinguished from ordinary forms of endometritis except by means of the microscope. As it is always important from the standpoint of treatment to recognize a tubercular lesion early, the uterine cavity should be cureted in every suspicious case and the scrapings and discharge examined microscopically.

Carcinoma.—A positive diagnosis cannot be made between cancer of the body of the uterus and tuberculosis without the use of the microscope, which should be resorted to at once on account of the necessity in both diseases for early surgical interference.

Treatment.—If the disease is limited to the uterus or is associated with infection of the tubes, the ovaries, or the peritoneum, complete abdominal hys-

terectomy with removal of the uterine appendages should be performed in every case, provided the general condition of the patient is good.

When the tubal affection is secondary to a tubercular area in the lungs, the question of hysterectomy depends upon the stage of the pulmonary disease and the health of the woman. Generally speaking, it is always advisable to remove the pelvic focus of infection whenever the patient is strong enough to stand the shock of the operation.

In cases in which the vagina as well as the uterus is involved operative interference is contraindicated.

In all non-operative cases the treatment should be palliative and consist in curetment of the uterine cavity, followed by the application of tincture of iodin, which should be reapplied twice a week for an indefinite length of time; good results are also obtained in some cases by introducing an iodoform suppository (gr. x) into the uterus two or three times a week.

THE FALLOPIAN TUBES.

Description.—Tuberculosis of the tubes is a more frequent disease than is generally supposed, and, according to Penrose, who has made a series of valuable observations on the subject, "tuberculosis is present in from 8 to 18 per cent. of all cases of inflammatory diseases of the uterine appendages." The disease manifests itself either as a *primary* or *secondary* infection. While primary tuberculosis of the oviducts is not an infrequent affection, yet the vast majority of cases are secondary to a general infection or to a tubercular condition of the peritoneum, the intestines, or the uterus.

Both oviducts are, as a rule, affected, and the disease eventually spreads to the uterus, the ovaries, and the peritoneum.

Varieties.—Tuberculosis of the tubes occurs in three forms as follows:

Miliary tuberculosis.
Chronic diffuse tuberculosis.
Chronic fibroid tuberculosis.

Miliary Tuberculosis.—This form of the disease is not infrequently met, and is usually associated with general miliary tuberculosis, although it may occur as a primary condition. It is always the initial lesion in the other varieties of the affection, and, like miliary tuberculosis of the mucous membranes elsewhere, the tubercles are deposited beneath the epithelium.

Chronic Diffuse Tuberculosis.—The caseous or cheesy pus tubes which are met from time to time are due to this form of tuberculosis. Like tubercular infection of the uterus, the disease begins in the form of miliary tubercles deposited in the mucosa, which finally break down into ragged ulcers covered with cheesy matter. Eventually the entire mucous membrane becomes involved and the tube is distended with typical yellowish cheesy material, which may be fluid or semifluid in consistency. In some cases the contents of the tube become more or less calcified or inspissated and form a hard, dry mass. Sometimes the caseous material is replaced by a collection of pus which forms in large sacs and often causes enormous distention of the tube. The disease is confined, as a rule, to the mucous membrane, but in advanced cases the muscular coat may become affected. Usually, however, the fimbriated extremity of the tube is closed and its walls are more or less thickened. Sometimes the cheesy material may be seen oozing from the mouth of the tube and soiling the adjacent peritoneal surfaces. When the affection is associated with tubercular peritonitis, the tube is studded externally with miliary tubercles and often covered with a cheesy deposit.

As the disease progresses, dense and general adhesions frequently form between the uterine appendages and adjacent organs.

Chronic Fibroid Tuberculosis.—According to Williams, this form "differs from the other varieties in the excessive formation of fibrous tissue in and between the tubercles. In this form of tubal tuberculosis the lumen of the tube is distorted and may or may not be the seat of the ordinary inflammatory affections. There is but slight tendency to caseation in these cases, and their most marked feature appears to be their chronicity; and no doubt in some instances it may indicate the spontaneous healing of the affection, just as occurs in other organs."

Symptoms.—The symptoms of tuberculosis of the oviducts differ in no way from those of a non-tubercular salpingitis, and as a matter of fact the presence of the disease is seldom suspected before its nature is revealed on the operating table or at an autopsy. When the disease is associated with infection of the uterus, the vagina, or the abdominal cavity, the local manifestations of these lesions modify the ordinary symptoms of salpingitis and obscure more or less their significance.

Diagnosis.—So long as the tubercular infection is limited to the oviducts it is impossible to recognize the nature of the lesion, and in cases where the disease coexists with tuberculosis in adjacent or distant organs the diagnosis is based solely upon inference, and our conclusions are therefore extremely doubtful. For while we may be justified in suspecting that a tubal mass is tubercular in origin when the disease exists elsewhere, yet we cannot say with any degree of certainty that such is the case.

The diagnosis is based upon a consideration of the following subjects:

The history.
The symptoms.
The physical signs.
The microscopic examination.

The History.—The family history of the patient should be ascertained in order, if possible, to prove the existence of a tubercular tendency. The presence of a tuberculous lesion in the husband is always suspicious, and should suggest a possible connection between it and a tubal enlargement in the wife. The clinical history of an existing salpingitis should be carefully investigated to ascertain, if possible, its origin, which can be traced, in the vast majority of cases, to a previous attack of sepsis or gonorrhea; but if the disease has developed so slowly that the patient is hardly aware of its presence and she can give no definite information as to a possible cause, the tubercular character of the tubal mass should at least be suspected. And, finally, the personal history of the patient is important if it shows a previous illness of a tubercular nature which has remained inactive and apparently cured for a number of years.

The Symptoms.—There is nothing characteristic in the symptoms that enable us to distinguish a tubercular from a non-tubercular salpingitis, and we can therefore only assume or suspect that the former condition exists where a tubal mass is associated with tuberculous infection in some other part of the body.

The Physical Signs.—The local lesions are revealed by *vagino-abdominal* and *recto-abdominal palpation*, and when considered alone they are of no diagnostic value, as they are similar to those occurring in cases of pyosalpinx; but where they are associated with tuberculous areas of infection in other parts of the body, or the vaginal discharges contain cheesy material, we may assume that the disease is tubercular in origin.

The character of the local lesions depends upon the duration and extent of the disease. Sometimes the tubes are slightly enlarged, hard, and nodular, or, again, they may be enormously distended with tubercular pus and form soft,

fluctuating masses in the pelvis. As a rule, the uterine appendages are displaced and firmly adherent to the surrounding structures. When the peritoneum is involved we may occasionally feel the miliary tubercles scattered over the surface of the tubes or upon the posterior face of the broad ligaments and the uterus.

The Microscopic Examination.—The microscope should be employed to examine the vaginal discharges for the presence of tubercle bacilli, which may occasionally be found, and thus decide the question of diagnosis.

Prognosis.—The prognosis of the disease is always grave. If the affection is secondary to tuberculosis in another part of the body, it adds to the previously existing dangers. Both primary and secondary tubal infections have a strong tendency to spread to the peritoneum, the uterus, and the ovaries, or to cause a general tuberculosis. Sometimes tubal suppuration may develop and the patient may die of exhaustion and sepsis, or the abscess may rupture internally and cause a fatal peritonitis.

A spontaneous cure may occur in very rare instances by the lesion undergoing calcareous or fibroid changes.

If the disease is limited to the tubes, the uterus, and the ovaries a complete cure follows their removal in many instances. Tubercular peritonitis is also occasionally relieved by the operation of salpingo-oöphorectomy.

Treatment.—The question of operative interference depends upon the situation of the various areas of infection and the general condition of the patient.

If the disease is limited to the tubes, salpingo-oöphorectomy should be performed; but when the ovaries and the uterus are also involved, complete abdominal hysterectomy with removal of the appendages is indicated. Incomplete hysterectomy is always contraindicated under these circumstances, as it is impossible to know whether or not the intracervical mucosa is the seat of infection.

Tubercular peritonitis is never a contraindication for operative measures, unless the disease is well advanced and the patient's general condition is bad, as abdominal section followed by drainage has a curative influence upon the disease.

In cases of early phthisis salpingo-oöphorectomy should be performed to remove the pelvic focus of infection and prevent the subsequent development of dangerous local or general conditions. When, however, the disease is well advanced or the general condition of the patient is not good, all forms of operative procedures are contraindicated.

THE OVARIES.

Description.—According to Williams, "no one has described a case of *primary* tuberculosis of the ovary." *Secondary* infection, on the other hand, is not an infrequent disease, and is generally associated with tuberculosis of the peritoneum or the oviducts, and in some cases it may be due to a general infection. In rare instances the ovary is the only genital organ affected in cases of phthisis or of tubercular peritonitis.

Pathology.—The disease occurs in the form of miliary tubercles, cheesy masses, or tubercular abscesses. The tubercles may only be found upon the surface of the ovary, or, again, they may also occupy the deeper structures of the organ. In some cases the gland contains cheesy deposits, while in others small pockets of tubercular pus are formed which may increase in size and eventually rupture into the peritoneal cavity. Adhesions do not occur, as a rule, between the ovary and the surrounding structures unless the tube is also involved or caseous masses and exudates form upon the surface of the organ.

Symptoms.—The symptoms are not characteristic and they differ in no way from those caused by a non-tubercular inflammation of the ovary.

Diagnosis.—It is impossible to make a positive diagnosis, and in the vast majority of cases the disease is not even suspected until the patient is operated upon or an autopsy is made.

A probable diagnosis of tuberculosis is based upon the principles discussed under the diagnosis of tubal infection (see p. 748).

Prognosis.—The prognosis is always grave. If the disease is limited to the ovaries, tubes, and uterus, a permanent cure may follow their removal. Where the ovarian infection is secondary to a tubercular peritonitis, complete recovery may result from the operation of salpingo-oöphorectomy.

Treatment.—The question of operative interference depends, as in the case of tubal tuberculosis, upon the situation of the various areas of primary infection and upon the state of the patient's health.

If the disease is associated with tuberculosis of the tubes or the uterus salpingo-oöphorectomy or complete abdominal hysterectomy with removal of the uterine appendages is indicated.

Where the affection is secondary to a tubercular peritonitis, the operation of salpingo-oöphorectomy, followed by drainage, should be performed unless the general condition of the patient is bad.

In cases of phthisis the uterine appendages should be removed unless the disease is well advanced and active.

CHAPTER XXXVI.

GENITAL FISTULAS.

Definition.—A genital fistula is an abnormal opening which connects the uterus, the vagina, or the perineum with the urinary tract or the intestines.

Classification.—Genital fistulas are divided into two primary varieties:

1. Urinary fistulas.
2. Fecal fistulas.

1. **Urinary Fistulas.**—These fistulas are subdivided into:

Vesicovaginal.	Urethrovaginal.
Vesico-uterine.	Ureterovaginal.
Vesico-uterovaginal.	Uretero-uterine.

2. **Fecal Fistulas.**—These fistulas are subdivided into:

Rectovaginal.	Rectolabial.
Rectoperineal.	Enterovaginal.

VESICOVAGINAL FISTULA.

Definition.—In this variety of fistula the abnormal opening occurs in the vesicovaginal septum, and there is consequently a direct communication between the bladder and the vagina.

Description.—These fistulas vary in size from a minute opening which scarcely admits a fine probe to that of a large hole in the septum involving the entire base of the bladder, and through which the vesical mucous membrane protrudes into the vagina. The opening may be situated in any part of the vesicovaginal septum, and it is usually oval or irregular in shape. In the beginning the

opening is always irregular in outline and its margins are thick and ulcerated. Later on, however, it gradually contracts and its edges become thin and hard. The tendency of a fistula is to close either by granulation or cicatrization, and even if the closure is not complete the opening is always greatly reduced in size in the course of a few weeks. In the case of a large fistula cicatricial bands are generally observed radiating from it over the vaginal walls, and in some instances the fistulous opening is firmly bound down against the pubic bone.

Causes.—A vesicovaginal fistula is the most common form of fistulous opening connected with the genital tract. It usually results from a protracted labor in which the advancing head becomes impacted and crowds the bladder against the symphysis pubis. Under these circumstances the vesicovaginal septum is injured and a slough occurs which becomes separated within a few days from the surrounding tissues, leaving an artificial opening between the bladder and the vagina. The obstetric forceps itself is probably never the cause of these injuries, and when they occur the delay in using the instrument is alone responsible for the traumatism. A vesicovaginal fistula is also caused by the sloughing which occurs in malignant disease of the vagina or the bladder; the pressure of an ill-fitting pessary; the ulceration which sometimes results from the presence of a large vesical calculus; and by the burrowing of a pelvic abscess.

Again, the septum may be injured in performing a vaginal hysterectomy; a fistulous tract may remain after a faulty operation on the anterior wall of the vagina; and an artificial opening may be purposely made to secure temporary drainage of the bladder in the treatment of cystitis. In rare instances a syphilitic ulceration is responsible for a fistula, and in some cases it may be due to a hematoma of the anterior vaginal wall which becomes infected and breaks down.

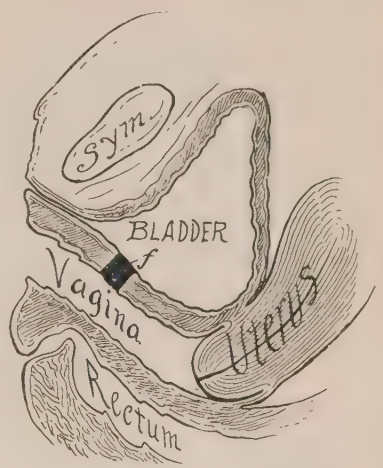


Fig. 645.—Vesicovaginal Fistula.

Symptoms.—The affection is characterized by more or less constant dribbling of urine from the vagina. If the fistula is caused by a protracted labor, the incontinence does not generally manifest itself before a week or ten days after the confinement, and in the interval there is usually an elevation of the temperature, frequent and painful micturition, and possibly a small quantity of blood mixed with the urine.

The degree of incontinence depends upon the situation of the fistulous opening and the position of the patient. If the fistula is in the upper part of the vesicovaginal septum and the patient assumes the erect position, the involuntary discharge may cease entirely until the urine accumulating in the bladder reaches the level of the opening (Fig. 646). For the same reason there is also temporary continence when the fistula is situated low down and the patient is in the recumbent posture (Fig. 647).

Sometimes when the patient is lying down the urine accumulates in the vaginal culdesac and escapes in a gush when she assumes the erect position.

The constant presence of the urine produces intense irritation, and the vulva, the vagina, and the inner surfaces of the thighs become inflamed, edematous, and excoriated. Urinary salts also accumulate on the parts over which the

urine dribbles, and the vagina, the vulva, and the mucous membrane of the bladder become encrusted with an offensive phosphatic deposit.

The affection is usually complicated by chronic cystitis, especially in cases in which the artificial opening is large, and it is not uncommon under these conditions for the kidneys to become diseased as the result of an ascending infection. The bladder and the urethra eventually become contracted from disuse and the vesical walls thickened and infiltrated.

The general health, as a rule, suffers, and the patient often becomes emaciated and anemic.

Diagnosis.—The diagnosis of a vesicovaginal fistula is based upon (1) the history and (2) the physical examination.

History.—The patient usually presents a history of either a protracted labor or a vaginal operation which was followed shortly afterward by a constant dribbling of urine from the vagina. As a rule, the urine is not passed at regular intervals,

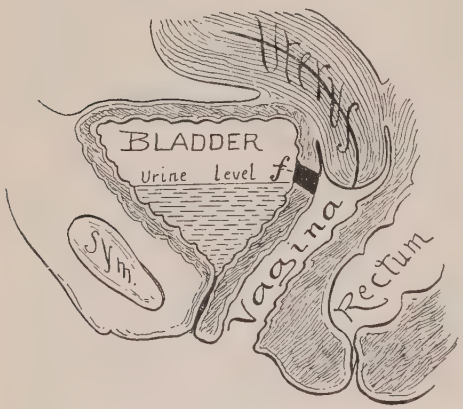


FIG. 646.

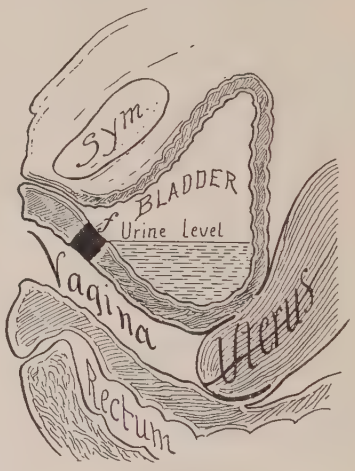


FIG. 647.

SYMPTOMS OF A VESICOVAGINAL FISTULA (page 751).

Fig. 646 shows why the involuntary discharge of urine from a vesicovaginal fistula in the upper part of the septum ceases temporarily when the patient assumes the erect position.

Fig. 647 shows why the involuntary discharge of urine from a vesicovaginal fistula in the lower part of the septum ceases temporarily when the patient assumes the recumbent position.

and there is never any attempt upon the part of the patient to empty the bladder naturally. If in addition to the normal act of urination there is dribbling of urine from the vagina, the case is probably one of ureteral fistula.

Physical Examination.—In some cases the parts are so tender and painful that it is necessary to employ a general anesthetic in order to make a thorough examination.

The physical signs are elicited by (*a*) touch and (*b*) inspection.

Touch.—The patient is placed in the *dorsal position* and the index-finger introduced into the vagina. If the fistula is large, it can readily be detected and the vesical mucous membrane felt protruding through it. In some instances the tip of the finger can be passed into the bladder and the vesico-urethral junction palpated. By passing the finger over the vaginal wall in the neighborhood of the fistula the character and extent of the cicatricial bands can be ascertained and

the presence or absence of adhesions to the pubic bone determined. A positive diagnosis is made by introducing a sound into the bladder through the urethra and passing its tip through the fistulous opening into the vagina, where it can readily be felt by the examining finger.

Inspection. The patient is placed either in the *dorsal*, the *left lateral-prone*, or the *knee-chest position*, and the anterior wall of the vagina exposed by retracting the perineum with Sims's or Simon's speculum. The dorsal posture is only employed in the examination of a fistula large enough to be easily detected, while the other positions are always used where there is any difficulty in locating the artificial opening.

After introducing a speculum the vagina is wiped dry with a gauze sponge and the anterior vaginal wall carefully inspected. There is no difficulty whatever in detecting a large fistula, and even one of very moderate dimensions can usually be seen by slowly inspecting the vaginal wall. After locating the opening it should be watched for a few minutes in order to detect the flow of urine, and a

FIG. 648.—DIAGNOSIS OF A VESICOVAGINAL FISTULA BY TOUCH.

The tip of the finger is shown introduced through the fistula into the bladder and pressed against the vesico-urethral juncture.

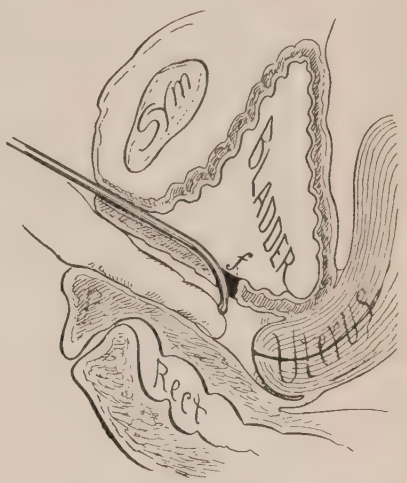


FIG. 649.—DIAGNOSIS OF A VESICOVAGINAL FISTULA BY TOUCH.

The tip of a sound is shown passed through the fistula from the bladder and in contact with the finger in the vagina.

sound should then be passed through the urethra and made to emerge in the vagina to confirm the diagnosis (Fig. 650).

In cases in which the fistulous opening is very minute and cannot be detected by the ordinary methods it can readily be located by distending the bladder with sterilized milk or a colored solution and noting the position on the anterior vaginal wall at which the fluid escapes into the vagina. In employing this method of examination the patient should be placed either in the dorsal or left lateral-prone position and the irrigating apparatus that is designed for flushing the bladder should be employed (see p. 620).

Prognosis.—The prognosis depends upon the cause and the character of the fistula. An artificial opening between the bladder and the vagina that is due to malignant disease is of course hopeless, and syphilitic ulcerations are usually attended with such extensive destruction of the septum that little or nothing can be done to remedy the condition.

In fistulas of traumatic origin the tendency is toward spontaneous closure by granulation or cicatrization, and in some instances primary union may even take place. Although this tendency toward a spontaneous cure exists in all fistulas, yet as a matter of fact the vast majority of these artificial openings are permanent unless they are closed by surgical means, and it is not uncommon for a very minute sinus to remain patulous for an indefinite length of time.

Operations for the relief of vesicovaginal fistulas are, as a rule, successful, although in some instances more than one operation may be required before the opening is finally closed. The operative prognosis, however, is not good in cases in which there is great loss of tissue, or where the opening and the septum are firmly adherent to the pubic bone, or where the bladder and the urethra are contracted. A thorough examination must therefore always be made before expressing an opinion, and the examiner should carefully note the size of the fistula, the condition of the vaginal walls, the facility of approximating the edges of the opening, the presence or absence of adhesions and cicatricial bands, and the capacity of the bladder and the urethra.

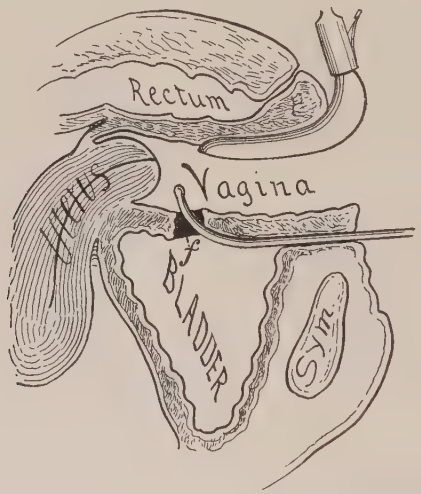


FIG. 650.—DIAGNOSIS OF A VESICOVAGINAL FISTULA BY INSPECTION (page 753).
The patient is shown in the knee-chest posture, the perineum retracted, and a sound passed from the bladder through the fistula into the vagina.

Treatment.—The treatment of vesicovaginal fistulas is divided into the management of (1) recent cases and (2) chronic cases.

Recent Cases.—As stated elsewhere, the slough does not separate nor the urine begin to dribble from the vagina for several days after the occurrence of the injury which is the cause of the fistula, and in the meantime the obstetrician usually does not even suspect the nature of the complication. As soon as the character of the accident is recognized, however, an effort should be made to bring about a spontaneous closure of the fistula by means of local cleanliness and attention to the character of the urinary excretions.

The vagina should be irrigated three or four times daily with a quart of hot boric acid solution (℥ij to the quart) and the urine rendered slightly acid to prevent the formation of phosphatic deposits, which occurs only when the reaction is alkaline. For this purpose nothing is better than the following formula recommended by Emmet:

℞. Acidi benzoici, ... ʒij
Acidi borici, ... ʒiij
Aquæ cinnamonis, ... f ʒxij.
M. Sig.—Tablespoonful in water four times daily.

After the urine has been rendered acid the dose should be carefully regulated in order to maintain the normal acidity without deranging the digestion. The patient should also drink three or four pints of distilled, Poland, or Bedford water daily to dilute the urine and keep it bland and innocuous.

In cases of small fistulas the above treatment may result in a spontaneous cure in from two to three months or longer; and even if the opening does not close, its size will be greatly diminished and the parts placed in the best possible condition for an operation.

Chronic Cases.—The management of chronic fistulas is divided into (*a*) the preparatory treatment, (*b*) the operative treatment, and (*c*) the treatment of inoperable cases.

Preparatory Treatment.—A preparatory course of treatment is usually required in cases of chronic fistulas in order, *first*, to remove the phosphatic deposits; *second*, to heal the excoriations; *third*, to promote the absorption of the induration around the fistula; *fourth*, to cure the coexisting cystitis; *fifth*, to relieve the tension caused by cicatricial bands and adhesions; and, *sixth*, to improve the general condition of the patient's health.

Duration of the Preparatory Treatment.—No definite length of time can be stated, as the character of the local conditions varies greatly in individual cases. In some instances but little, if any, preparatory treatment is needed; in others, again, it may take from one month to six weeks to place the parts in a proper condition for operation; and, finally, the lesions may be of such a character that several months must elapse before any attempt can be made to close the fistulous opening.

Phosphatic Deposits.—The deposits of urinary salts are removed from the vagina and the surrounding parts with a pledget of absorbent cotton held in the grasp of dressing forceps, and the raw surfaces remaining are painted twice a week with a solution of nitrate of silver (gr. x–f ʒj) until they are healed. The reaccumulation of the salts is prevented by irrigating the vagina three times a day with a gallon of hot boric acid solution (ʒij to the quart) and rendering the urine acid with Emmet's mixture or 5-grain doses, three times daily, of the benzoate of sodium or ammonium. In addition, the patient should drink three or four pints of distilled, Poland, or Bedford water daily to dilute the urine and render it innocuous.

Excoriations.—The excoriations which occur on the vulva and the inner aspects of the thighs should be painted twice a week with the solution of nitrate of silver mentioned above and the surfaces protected from the dribbling urine by smearing them lightly night and morning with carbolated oxid of zinc ointment (3 per cent.) after washing the parts thoroughly with warm water and soap. A hot sitz-bath at bedtime is often very beneficial in these cases, and not only assists materially in relieving the local irritation but also promotes the healing process.

Indurations.—The hypertrophied and indurated condition of the margins of the fistula is relieved by the vaginal injection of hot boric acid solution, the removal of incrustations, the application of the silver solution to the raw edges, and the use of a hot sitz-bath at bedtime. The improvement in the appearance of the fistula after several weeks of treatment is most marked, and the hard nodular margins become soft and normal in consistency.

Cystitis.—The presence of cystitis is always a contraindication to the closure

of a fistula, and we must therefore cure the inflammation of the bladder before repairing the injury in the septum.

The treatment of the cystitis consists in keeping the urine diluted and slightly acid by the means described above, the use of a hot sitz-bath at bedtime, and vesical douches of a gallon of hot boric acid solution (℥ij to the quart) three times daily. The patient is placed in the dorsal position with her hips resting on a douche pan and a glass catheter, which is attached to an ordinary fountain syringe, introduced through the urethra into the bladder. The fluid from the syringe first flushes the bladder and then flows through the fistula into the vagina and over the vulva. When these douches are employed, it is unnecessary to give the usual vaginal injections of boric acid solution, as the vagina and surrounding parts are sufficiently irrigated by the fluid which flows through the fistulous opening.

When a fistula is small, the residual urine which collects is often the cause of the cystitis, and unless we secure free drainage of the bladder the inflammatory condition cannot be cured. Under these circumstances the fistula itself is either

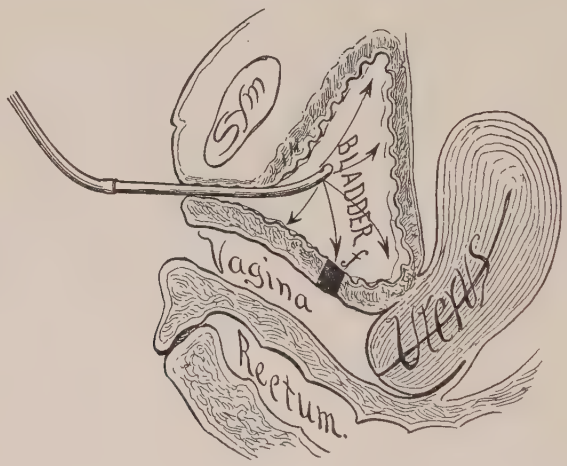


Fig. 651.—Treatment of a Vesicovaginal Fistula.
Flushing the bladder and at the same time irrigating the vagina through the fistula.

enlarged or a second opening made in the most dependent part of the septum in order to prevent the accumulation of urine and thus remove the source of the vesical infection.

In some cases the kidneys are so badly diseased that all forms of operative procedure are contraindicated, and nothing can be done except to keep the parts scrupulously clean with hot boric acid injections and have the patient wear an ambulatory urinal (Fig. 764).

The bladder should always be examined for stone as a routine practice before beginning the preparatory treatment or closing the fistula, and if a calculus is found it should be removed at once through the opening in the septum.

Tension.—After the vagina and the surrounding parts have been restored to as healthy a condition as possible, a careful visual examination should be made of the fistula and the adjacent vaginal walls in order to determine accurately the amount of scar tissue present and the facility with which the edges of the opening can be approximated, as the slightest traction upon the sutures will cause the operation to be a failure. This is accomplished by placing the patient in either

the dorsal or left lateral-prone position and exposing the fistula with a Sims or Simon speculum. The edges of the fistula are then caught with tenaculums at opposite points and drawn together to estimate the amount of traction. In making this test we should always endeavor to bring the margins together laterally in a line with the long axis of the vagina, as a transverse union of the opening may result in a serious shortening of the vagina and interfere more or less with its functions.

If the cicatricial bands are slight and superficial and the edges can be brought together with a moderate amount of tension, no preparatory treatment of the adhesions is required, as they can readily be divided at the time of operation when the fistula is finally closed. In some cases, however, the cicatricial bands are so extensive that the margins of the opening are fixed and cannot be approximated in any direction, or in others the scar tissue may obliterate more or less the lumen of the vagina and interfere with an operation. Under these circumstances, therefore, a preparatory course of treatment must be instituted to relieve the tension and enlarge the vaginal canal.

FIG. 652.—TREATMENT OF VESICOVAGINAL FISTULAS.

Showing the method of determining the amount of traction required in bringing the edges of a fistula together.

There are two methods by which these objects are accomplished, and their selection in individual cases must depend upon the personal experience of the surgeon. They are: (A) Division with subsequent dilatation; (B) division with immediate suturing.

DIVISION AND DILATATION.—The patient is anesthetized and placed in either the dorsal or left lateral-prone position. The perineum is then retracted with Sims's speculum and the situation and character of the cicatricial bands ascertained by sight and touch. They are then divided with blunt scissors or a bistoury in various directions until the tension on the fistula is relieved and its edges can be approximated.

The vagina is then irrigated with a hot solution of boric acid (℥ij to the quart) and dried with a gauze sponge. A Sims's glass vaginal plug (see Fig. 200, p. 224) is now introduced into the vagina and held in position with a gauze compress and a T-bandage.

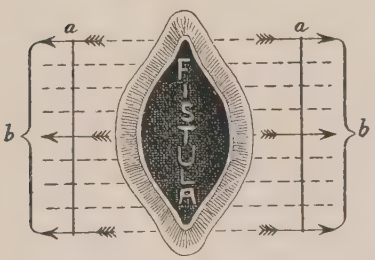


FIG. 653.—TREATMENT OF A VESICOVAGINAL FISTULA BY DIVISION AND DILATATION OF THE CICATRICIAL BANDS.

b, *b*. Represents the contracted scar tissue; *a*, *a*, indicates the direction of the lines of incision.

The plug should be worn constantly for three weeks and removed temporarily once or twice a day for the purpose of cleaning the vagina with a solution of boric acid. If the urine accumulates in the bladder on account of the closure of the fistula by the plug, it should be drawn with a catheter every eight hours, otherwise all that will be required is to change the compress and T-bandage frequently. At the end of a week or ten days the patient should be allowed to get out of bed and go around with the vaginal plug in the vagina. At the end of three weeks the incisions are usually healed, and an examination should then be made to determine the condition of the parts. If the tension on the fistula has been relieved and its edges can readily be approximated, the opera-

tion for closing the opening should be performed without further delay; but if there is still some traction remaining, the division and dilatation of the cicatricial bands should be repeated.

The glass plug which is used must be sufficiently large to stretch the vagina and control the bleeding from the divided tissues without causing enough pressure to produce sloughing. The changes which occur in the parts after wearing the plug for several weeks are sometimes surprising, and it is not uncommon to find that the vagina has been greatly increased in size and the cicatricial tissue more or less completely absorbed.

Division and Suturing.—The patient is prepared and arranged for the operation as in the previous method (*division and dilatation*), and after the parts are exposed the cicatricial bands are divided in various directions until the tension on the fistula is removed and the edges can be readily approximated. The resulting wounds are then drawn apart with tenaculums and closed by approximating their angles with catgut sutures.

The *after-treatment* consists in irrigating the vagina twice a day with boric acid solution and keeping the bowels regular so as to avoid traction upon the sutures. The patient should be allowed to get out of bed in one week, and at the end of a month the final operation for closing the fistula may be performed,

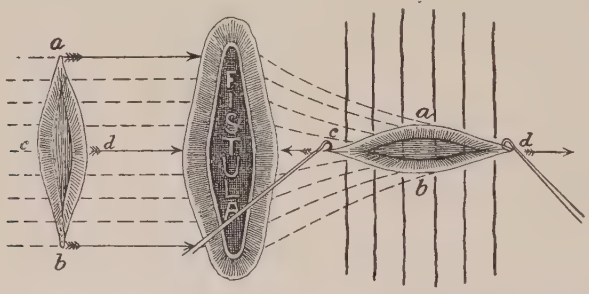


Fig. 654.—Treatment of a Vesicovaginal Fistula by Division and Suturing.

On the left of the fistula an incision is shown through the interrupted lines which represent the scar tissue; on the right the edges of the incision (*c*, *d*) are drawn apart with tenaculums and the angles of the wound (*a*, *b*) approximated with sutures.

provided the tension has been relieved. If, however, the traction upon the opening has not been completely removed, the operation should either be repeated as described above or the division and the suturing can be done at the time of the closure of the fistula if the extent of the adhesions does not contraindicate such a procedure.

General Condition of the Patient.—Advantage should be taken of the time consumed in the preparatory treatment of the local lesions to improve the general health of the patient and place her in the best possible condition for operation. This naturally includes attention to the digestion and the bowels, and the administration of such remedies as may be required from time to time to meet the special indications in the case.

Operative Treatment.—This consists in denuding the edges of the fistula and approximating them with sutures.

The Proper Time to Operate.—In *recent cases* the best time to operate is from six weeks to two months after confinement, or even longer if the fistula shows a tendency to close spontaneously under treatment. At this period the normal involution of the parts which occurs after pregnancy has taken place, the adhesions, and the contractions which form later are absent, and the fistulous open-

ing has become more or less diminished in size. The tissues are therefore not only in the best possible condition to operate upon, but the fistula has been given an opportunity to close spontaneously, which it sometimes does if the opening is small.

In *chronic cases* the best time to operate is when the parts have been restored to a healthy condition by the preparatory treatment. In some instances, when the fistula is small and not attended with cystitis or other local lesions, very little, if any, time is required for preparation before finally closing the opening.

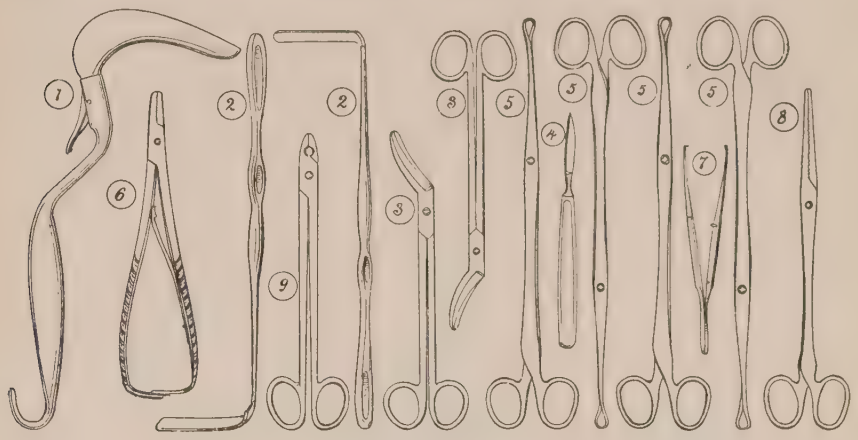


FIG. 655.—INSTRUMENTS USED IN THE OPERATION FOR THE REPAIR OF A VESICOVAGINAL FISTULA.

In cases in which a second operation is required on account of partial or complete failure it should not be performed until six weeks have elapsed since the first attempt was made to close the fistula.

Preparation of the Patient.—The patient is prepared in the same manner as for an ordinary plastic operation (see p. 830), except that a boric acid solution (℥ij to the quart) is substituted for the corrosive sublimate injections that are used to cleanse the vagina, as the exposure of the vesical mucous membrane contraindicates the employment of the latter antiseptic.

Final Sterilization of the Patient.—After placing the patient on the operating table the vagina and vulva are thoroughly scrubbed with liquid soap and warm water (see p. 831); the bladder flushed through the urethra with hot boric acid solution, and the vaginal canal is wiped dry with a gauze sponge.

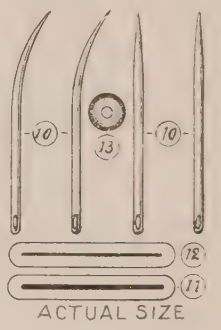


FIG. 656.—NEEDLES, SUTURE MATERIALS, AND PERFORATED SHOT USED IN THE OPERATION FOR THE REPAIR OF A VESICOVAGINAL FISTULA.

Position of the Patient.—I prefer to operate, as a rule, with the patient in the dorsal posture. In some cases, however, a better exposure of the field of operation can be obtained and the operative manipulations facilitated by placing her in the left lateral-prone position.

Number of Assistants.—An anesthetizer, two assistants, and a general nurse are required.

Dressings, etc.—For the contents of the conveyance boxes see page 832.

Instruments.—(1) Simon's speculum (curved blade); (2) two lateral vaginal

retractors; (3) right and left slightly curved Emmet's scissors; (4) scalpel; (5) four bullet forceps; (6) needle-holder; (7) tissue forceps; (8) dressing forceps; (9) shot compressor; (10) two straight and two slightly curved round-pointed needles; (11) silkworm-gut—20 strands; (12) plain cumol catgut No. 2, four envelopes; (13) perforated shot (Figs. 655 and 656).

Operation.—First Step.—The field of operation is exposed to view by retracting the perineum with Simon's speculum, and, if necessary, stretching the lateral walls of the vagina apart with retractors.

Second Step.—The anterior vaginal wall is seized with bullet forceps at four points opposite to each other and about one-half of an inch beyond the margins of the fistula. Traction is then made in opposite directions and the intervening tissues drawn taut.

Third Step.—A superficial incision is made with the scalpel around the fistula to mark the limits of the denudation and prevent the removal of an unnecessary amount of tissue. The incision should extend about one-fourth of an

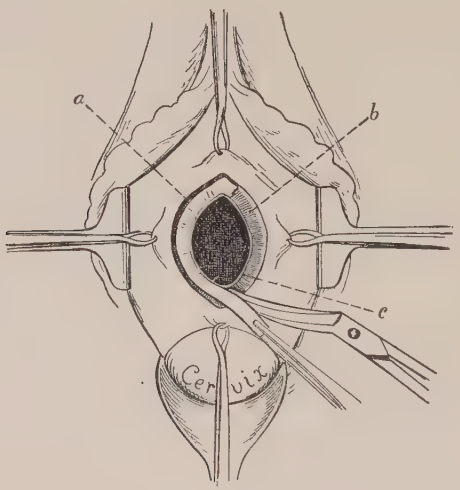


Fig. 657.—Operation for the Repair of a Vesicovaginal Fistula—**First, Second, Third, and Fourth Steps.**

a, Indicates the superficial incision marking the limits of the denudation; *b*, the denuded edge of the fistula; *c*, the mucous membrane of the bladder. Note that the left side of the fistula is being denuded.

inch or more beyond the edge of the fistula in order to insure a broad approximation surface when the denudation is completed.

Fourth Step.—The vaginal mucosa is seized with tissue forceps at any point along the line of the incision and the mucous membrane cut away in strips with scissors down to but not including the mucous membrane of the bladder.

Fifth Step.—The edges of the fistula are approximated in the line of the long axis of the vagina by crossing the bullet forceps that are attached to the sides of the opening, and they are then brought together transversely with the upper and lower forceps in order to ascertain in what direction the margins can be united with the least possible tension upon the sutures.

Sixth Step.—The wound is sutured by introducing the needle about one-eighth of an inch from the denuded edge of the vaginal mucosa, and passing it beneath the raw surface of the septum to emerge at the edge of the vesical mucous membrane. It is then reintroduced on the opposite side of the fistula and

passed through the septum in an inverse order. The sutures are placed about one-fifth of an inch apart.

Seventh Step.—After all the sutures are in position the bladder is thoroughly irrigated through the urethra with hot boric acid solution to remove the blood and clots which may have accumulated.

The silkworm-gut sutures are then shotted, the vagina irrigated with a solution of corrosive sublimate (1 to 2000) and dried with a gauze sponge. A loose gauze tampon is finally inserted into the vagina and the speculum withdrawn.

Special Directions.—Denudation.—It is important to denude the edges of the fistula down to but not including the mucous membrane of the bladder and to have a wide approximation surface. If the denudation includes the vesical mucosa, it may retract into the bladder and prevent the operator from seeing the bleeding points should a hemorrhage occur. The mucous membrane of the vagina always retracts more or less so soon as the edges of the fistula are denuded, and consequently the raw surface which results is wider than the original area of denudation. After the denudation is complete the surfaces should be carefully inspected and any small islets of tissue which may have been overlooked are picked up with tissue forceps and snipped off with scissors. A very small fistula must first be enlarged before its edges can be denuded and the sutures introduced, and a round fistula must have a V-shaped piece of the vaginal mucous membrane removed at opposite points to prevent the tissues from puckering when they are approximated by the sutures.

Fig. 658.—Operation for the Repair of a Vesicovaginal Fistula—Sixth and Seventh Steps.

Showing the method of introducing and shotting the silkworm-gut sutures. Note that the sutures do not pass through the bladder mucosa.

Sutures.—It is important not to include the vesical mucous membrane when the sutures are introduced, otherwise bleeding is likely to result or a sinus may be formed which often becomes the starting-point of a minute fistulous opening. Care must also be taken when shotting the sutures to avoid any undue tension upon them or they will cut through the tissues and defeat the object of the operation. If any tension is exerted on the sutures after they are shotted, short longitudinal incisions should be made into the scar tissue on each side of the fistula with a scalpel and the wounds closed in the opposite direction to their long axes by interrupted catgut sutures (see Fig. 654, p. 758).

Hemorrhage.—Intravesical hemorrhage and the formation of blood-clots in the bladder are serious complications, as they may cause violent tenesmus from overdistention and thus imperil the results of the operation or even endanger the life of the patient. This accident may be guarded against by avoiding injury to the vesical mucosa while denuding the edges of the fistula, checking all bleeding points before closing the opening, and by irrigating the bladder with hot boric acid solution before shotting the sutures.

Ureters.—When the fistula is situated at or near the neck of the bladder, its margins should be carefully inspected before making the denudation, and again before introducing the sutures, otherwise one or both of the ureters may be wounded by the scissors or occluded by the stitches. If the ureters are found to be in the way, a wider denudation than usual should be made on the vaginal surface of the septum and the sutures passed more superficially in order to turn the ureteral canals into the baldder and avoid pinching them when the edges of the fistula are approximated.

After-treatment.—Care of the Wound.—The vaginal tampon is removed at the end of twenty-four hours and not introduced again. The vagina is then douched once a day with a solution of hot corrosive sublimate (1 to 2000), followed by normal salt solution.

Bladder.—During the first two days the urine is drawn with a catheter every two hours, and then every four hours until the sixth day, when the patient is allowed to empty her bladder naturally every six or eight hours. Under no circumstances should a self-retaining or permanent catheter be employed. In cases in which the fistula is small it is unnecessary to empty the bladder with a catheter, and the patient should, if possible, void the urine herself every four or five hours for the first three or four days.

Bowels.—The bowels should be moved on the second day by a purgative dose of citrate of magnesia and then kept open daily with a mild laxative and the occasional use of a simple enema of soapsuds and warm water.

Urine.—Careful attention must be given to the renal excretions during convalescence, and the urine should be kept slightly acid and diluted by the administration of Emmet's mixture (see p. 755) or 5-grain doses of benzoate of sodium or ammonium and the ingestion of three or four pints of distilled, Bedford, or Poland water daily. Unless the reaction of the urine is kept normal by these means, urinary salts are likely to form on the vesical surface of the line of union and imperil the results of the operation.

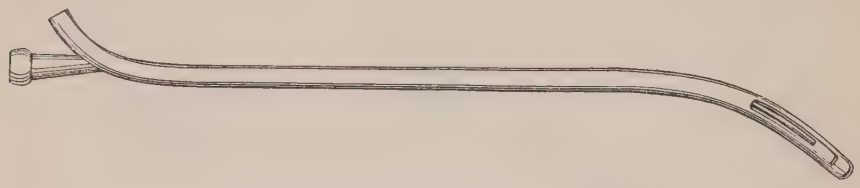


Fig. 659.—Double-current Female Catheter.

Diet.—During the first three days a liquid diet (p. 106) is given, and then a soft diet (p. 111) until the patient gets out of bed, after which she is placed on a convalescent diet (p. 114).

Position of the Patient.—It is not necessary to keep the patient in one position for any length of time, and she may therefore from the first lie on her back with a pillow under the knees, or upon her side.

Removal of the Sutures.—The sutures are removed on the eighth day. In removing them the traction should be toward the line of union and counter-pressure should be made against the tissues with a tenaculum, otherwise there is danger of tearing the freshly united edges of the wound apart and destroying the results of the operation.

Intravesical Hemorrhage.—Should blood or clots accumulate in the bladder, it should be irrigated with a hot solution of boric acid, using for the purpose a double-current female catheter attached to a fountain syringe. The double-current catheter flushes out the bladder without distending it, and the force of the flow can be regulated by the height of the rubber bag. Should this method fail to control the hemorrhage or wash out the clots, the fistula must be reopened, the bleeding point found and ligated with a catgut ligature, the bladder irrigated through the urethra with hot boric acid solution, and the sutures reintroduced.

Occlusion of the Ureters.—If symptoms of occlusion of one or both of the ureters occur, the sutures must be removed, the ureteral injuries treated

according to the principles laid down on page 675, and the edges of the fistula again united.

Getting Out of Bed.—The patient should remain in bed for two weeks and then be kept in her room for seven days more before being allowed to go out-of-doors.

Contraction of the Bladder.—If the size of the bladder is only moderately diminished, it usually regains its normal capacity in the course of one month or six weeks after the closure of the fistula, and under these conditions no special treatment is therefore required. But when the contraction is marked and the patient continues to suffer from frequent urination after this period has elapsed, the bladder must be treated by hydrostatic dilatation (see p. 647) until it is sufficiently dilated to enable the woman to hold her urine for six or eight hours at a time.

Contraction of the Urethra.—This complication can usually be cured by dilating the urethra twice a week with a metal sound until a No. 32 (French scale) instrument passes freely into the bladder.

Variations in the Operative Technic.—The following operative procedures have been successfully adopted in large vesicovaginal fistulas in which the loss of tissue in the vaginal septum is so great and the scar tissue in the vagina so extensive that the edges of the opening cannot be approximated in the usual way.

1. Howard A. Kelly dissects the bladder entirely away from the uterus and sutures it to the denuded vaginal wall anteriorly. He begins by making a crescentic incision around the posterior two-thirds of the fistula and separating by blunt dissection the bladder wall from the vagina and the cervix up to the reflection of the peritoneum. The edges of the anterior third of the fistulous opening are then denuded down to but not including the vesical mucous membrane. The posterior wall of the bladder is then pulled forward and sutured to the denuded anterior third of the fistula with interrupted silkworm-gut sutures. The sutures are passed through the under surface of the posterior bladder wall so as to invert its edges and prevent the urethral orifice from being compressed when the opening is closed. The vaginal wound is allowed to heal by granulation.

2. Mackenrodt makes an incision completely around the edge of the fistula and separates the bladder from the vagina by a blunt dissection. He then denudes the margins of the bladder wall and sutures the vesical opening independently with silkworm-gut, leaving the vaginal wound to heal by granulation.

The following operations should never be performed for the relief of large or inoperable fistulas:

Closure of the Vagina (*Colpocleisis*).—The object of this operation is to close the vagina and utilize it as a common receptacle for the uterine discharges and the urine. Stagnation and infection eventually occur in every case, and the condition of the patient becomes so serious that free drainage must be secured by reopening the vagina.

Closure of the Fistula with the Cervix Uteri.—In this operation the neck of the uterus is utilized to close the fistula by turning it into the bladder and securing it with sutures to the margins of the opening. As in the case of the previous operation, stagnation of the uterine discharges and the urine is certain to result, and the infection may extend to the Fallopian tubes and the peritoneum or to the ureters and the kidneys. Urinary salts are also deposited in the bladder and the patient suffers intensely from cystitis.

Treatment of Inoperable Cases.—This consists in removing and preventing the formation of phosphatic deposits, healing the excoriations, curing the coexisting cystitis, and improving the general health of the patient.

These subjects are fully discussed under the preparatory treatment for operation (see p. 755), and need not, therefore, be referred to again.

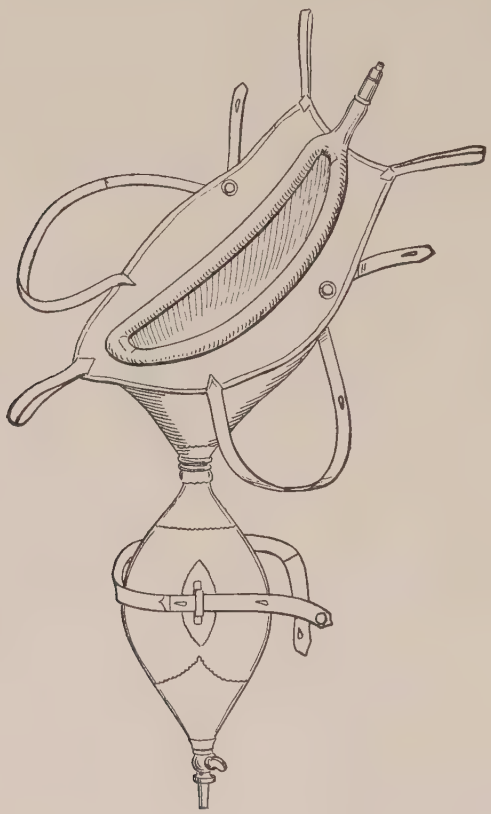


FIG. 660.—AMBULATORY URINAL.

A properly fitting ambulatory urinal should be worn to collect the urine as it escapes from the vagina and prevent the external parts from becoming inflamed or excoriated.

VESICO-UTERINE FISTULA.

Definition.—In this variety of fistula there is an abnormal opening between the bladder and the cervical canal.

Causes.—These fistulas are traumatic in origin and are caused by a tear during labor extending through the anterior lip of the cervix into the bladder. The lower portion of the laceration usually heals and leaves a fistulous track above, through which the urine escapes into the cervical canal.

Symptoms.—The affection is characterized by more or less constant dribbling of urine from the vagina and the usual deposit of urinary salts. The external parts become inflamed and excoriated and the general health of the patient, as a rule, suffers.

Diagnosis.—The diagnosis is based upon (1) the history and (2) the physical examination.

History.—The patient presents a history of a protracted labor, followed in a short time by a constant dribbling of urine from the vagina. As a rule, there is no attempt upon the part of the patient to empty the bladder naturally, as would be the case if the incontinence was due to a ureteral fistula.

FIG. 661.—VESICO-UTERINE FISTULA.

Physical Examination.—The physical signs are elicited by (*a*) inspection and (*b*) touch.

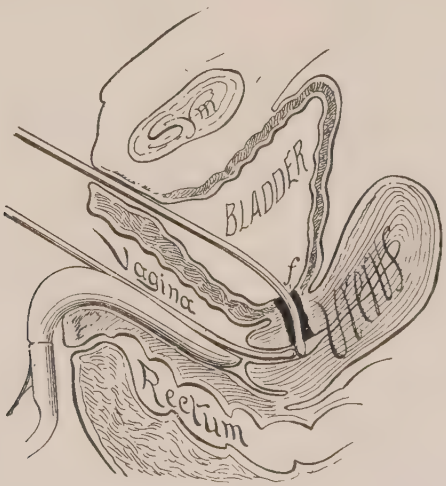


FIG. 662.—DIAGNOSIS OF A VESICO-UTERINE FISTULA BY TOUCH (page 766).
The tip of a sound is shown passed from the bladder through the fistula and in contact with another sound in the cervical canal.

Inspection.—The patient is placed in the dorsal position and the cervix exposed with a speculum. The vagina and the os uteri are then wiped dry with a gauze sponge and the examiner watches to detect the urine escaping from the

cervix. In order to make sure that the fistulous opening is not connected with a ureter the bladder is distended with sterilized milk, and if the fluid is seen flowing from the os uteri the vesical origin of the urine is positively determined.

T o u c h .—In some cases it may be possible to introduce a metallic sound into the bladder and then pass it through the fistulous opening into the cervical canal, where its presence may be detected by striking it with another sound inserted into the cervix (Fig. 662).

Prognosis.—Vesico-uterine fistulas, as a rule, tend to heal spontaneously by contraction and granulation, and at least six weeks or two months should be allowed to elapse after the injury before resorting to surgical means to effect a cure.

Treatment.—These fistulas may be closed by either of the two following methods:

First Method.—The original injury is reproduced by dividing the anterior

Fig. 663.

Fig. 664.

Operation for the Repair of a Vesico-uterine Fistula. (Modified from Kelly.)
Showing the **second method**, or the operation by the suprapubic route.

lip of the cervix down to the sinus tract, which is then denuded and the entire wound closed with interrupted silkworm-gut sutures. The sutures are removed on the eighth day.

This is the operation of selection in all cases except where there is a large amount of cicatricial tissue in the vagina and the contraction of the canal prevents the necessary exposure of the parts.

Second Method.—In this operation the sinus is reached through an incision in the abdominal wall immediately above the symphysis pubis. After opening the abdomen the uterus is pulled into the incision and the bladder carefully separated by dissection down to the fistulous track. The sinus is then divided and the opening in the bladder closed by interrupted catgut sutures. The margins of the uterine end of the fistula are then denuded and approximated by interrupted catgut sutures. The peritoneum is then drawn over the field of operation and sutured to the uterus; the abdomen is closed in the usual manner.

VESICO-UTEROVAGINAL FISTULA.

Definition.—In this variety of fistula there is an abnormal opening between the bladder and the vagina through the anterior lip of the cervix.

Causes.—These fistulas are traumatic in origin and are due either to sloughing of the parts or to a direct tear which extends through the cervix and the vault of the vagina into the bladder.

Symptoms.—The affection is characterized by dribbling of urine from the vagina, the deposit of urinary salts, local inflammation and excoriations, and more or less impairment of the general health.

Diagnosis.—The diagnosis is made by seeing the urine escape through the fistulous opening and by introducing a sound into the bladder and passing it through the fistula out into the vagina. The vesical origin of the urine can be determined, as in the case of a vesico-uterine fistula, by distending the bladder with sterile milk and observing it escape from the fistulous opening.

Prognosis.—These fistulas seldom heal spontaneously unless they are small and unattended with a large amount of scar tissue.

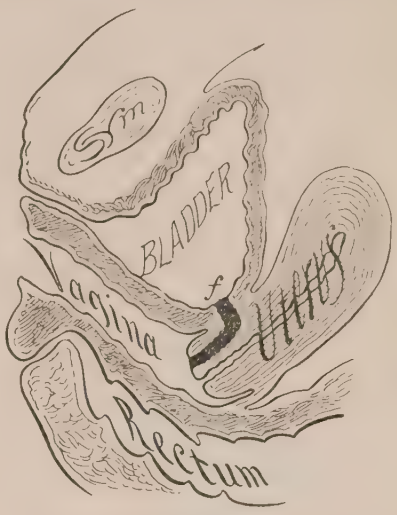


FIG. 665.—VESICO-UTEROVAGINAL FISTULA.

Treatment.—In the case of a small fistula which is not complicated with much cicatricial tissue a deep,

FIG. 666.

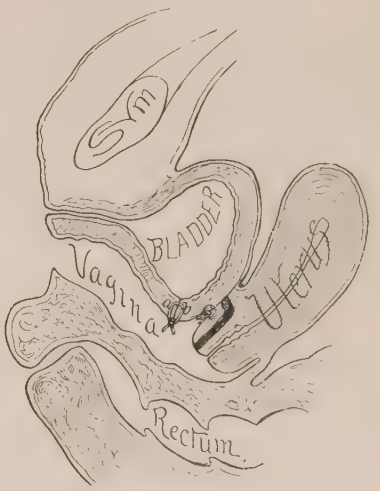


FIG. 667.

OPERATION FOR THE REPAIR OF A VESICO-UTEROVAGINAL FISTULA (page 768).

Fig. 666 shows the separation of the cervix from the bladder beyond the fistula (*a*, *b*); Fig. 667 shows the fistula (*a*, *b*) brought down and closed and the vagina reunited to the cervix.

wedge-shaped denudation can be made from the vaginal surface down to the sinus tract and the wound closed with interrupted silkworm gut sutures.

When there is a large amount of scar tissue present, the best method of opera-

tion is to separate the uterus from the bladder and then suture the fistula. This is accomplished by separating the anterior lip of the cervix from the vaginal vault and then dissecting the bladder with the fistula free from the supravaginal cervix. The edges of the fistula are now denuded down to the vesical mucous membrane; the opening closed with two or three layers of continuous catgut sutures; and the vaginal vault united again to the cervix by means of interrupted sutures of silkworm-gut (Figs. 666 and 667).

URETHROVAGINAL FISTULA.

Definition.—In this variety of fistula there is an abnormal opening between the urethra and the vagina. The fistula is usually small and situated in the upper part of the urethral canal. Sometimes, however, it may involve the vesico-urethral juncture and be associated with a serious injury at the base of the bladder.

Causes.—These fistulas are not common, and are caused either by an injury occurring during labor, or are due to malignant or syphilitic ulceration, or they result from an operation performed upon the urethra.

Fig. 668.—Urethrovaginal Fistula.

Symptoms.—If the fistula does not involve the vesico-urethral juncture there is no incontinence present and the bladder is emptied naturally, the urine escaping into the vagina during micturition instead of passing out through the external urinary meatus.

Diagnosis. — The diagnosis is based upon the physical examination, which reveals an opening in the floor of the urethra through which a catheter or a sound can be passed into the vagina.

Prognosis.—These fistulas have no tendency to heal spontaneously, and unless the neck of the bladder is involved they cause no inconvenience whatever to the patient.

Treatment. — The opening is closed in the same manner as that described for a vesicovaginal fistula. As the urethrovaginal septum is very thin, the denudation must be made well out on the surface of the vagina and the sutures introduced from side to side so that the line of union will be in the long axis of the urethra. Before introducing the sutures a metal catheter is passed into the bladder to support the urethral canal and facilitate the passage of the needle through the tissues.

URETEROVAGINAL FISTULA.

Definition.—In this variety of fistula there is an abnormal communication between one of the ureters and the vagina.

The **causes, symptoms, diagnosis, prognosis,** and **treatment** are discussed under Malformations and Injuries of the Ureters on pages 672 and 674.

URETERO-UTERINE FISTULA.

Definition.—In this variety of fistula there is an abnormal communication between one of the ureters and the cervical canal.

The **causes, symptoms, diagnosis, prognosis,** and **treatment** are discussed under Malformations and Injuries of the Ureters on pages 672 and 674.

RECTOVAGINAL FISTULA.

Definition.—In this variety of fistula there is an abnormal communication between the rectum and the vagina which may be situated at any part of the posterior vaginal wall.

Description.—These fistulas vary in size from a very minute opening to that of one large enough to admit a finger, and in some cases almost the entire rectovaginal septum is destroyed.

Causes.—The ulceration which takes place in cancer of the cervix is frequently the cause of a fistulous opening between the upper part of the vagina and the rectum, and a fistula in the lower part of the canal is not uncommonly due to an imperfect union following an operation for the repair of a laceration through the sphincter ani muscle and the rectovaginal septum. In some cases a fistulous opening may be due to a syphilitic or tuberculous lesion, and in others it may be caused by the burrowing of pus in a prerectal or pelvic abscess. Instances have also been observed in which the fistula was caused by the long-continued pressure of a pessary or some other foreign body in the vagina, and cases have likewise been met in which the abnormal opening was due to a penetrating wound the result of external violence.

FIG. 669.—RECTOVAGINAL FISTULA.

Symptoms.—The chief symptoms of the affection are the escape of feces and flatus into the vagina and the subsequent development of vaginitis and vulvitis from the irritation produced by the constant presence of fecal matter. The local condition of the patient is often disgusting; she broods over her condition, secludes herself from society, and in some instances she may even become melancholic.

The severity of the symptoms depends upon the size of the fistula. A large opening allows the feces and the flatus to escape freely into the vagina and the vulva is consequently covered with excrementitial matter. On the other hand, solid feces will not pass through a small fistula, and hence the patient can usually keep the parts in a clean condition unless she is suffering with diarrhea. There is, however, absolutely no control over the gas, which escapes from time to time with an audible sound and prevents the patient from enjoying social intercourse.

Diagnosis.—The diagnosis of a rectovaginal fistula is based upon (1) the history and (2) the physical examination.

History.—The patient gives a history of inability to control liquid feces and flatus, and she complains of the constant presence of more or less excrementitial matter on the vulva.

Physical Examination.—The physical signs are elicited by (*a*) touch and (*b*) inspection.

Touch.—The patient is placed in the *dorsal position* and the index-finger introduced into the vagina. If the fistula is large, its vaginal opening can readily be felt and the tip of the finger passed into the rectum. A small fistula, on the other hand, feels like a shallow pit or depression, and its connection with the bowels can be demonstrated by passing a probe through the opening into the rectum, where it can be recognized by rectal touch (Fig. 92). The rectal end of a fistula always forms a characteristic funnel-shaped depression, which can be located by palpating the anterior wall of the rectum, and then, by pushing it forward with the tip of the finger, the vaginal opening becomes dilated and can readily be seen.

Inspection.—The patient is placed in the *dorsal position* and the posterior wall of the vagina exposed by elevating the anterior wall with a Simon speculum. The entire surface of the vaginal wall is then carefully inspected, and if any abnormal pits or depressions are noted they are sounded with a fine probe, which passes at once into the rectum if a fistulous opening exists. Large fistulas are readily seen by simple inspection, but small ones are very apt to escape detection, and require a special method of examination to ascertain their position. This is easily accomplished by injecting milk into the rectum and observing the point on the vaginal wall at which it escapes into the vagina. The best apparatus for the purpose consists of a fountain syringe with the rectal nozzle attached; the bag is filled with milk and held about three feet above the patient while the fluid is allowed to flow into the rectum.

Prognosis.—A fistula caused by cancerous ulceration is incurable, and the prognosis should always be guarded when the abnormal opening is due to syphilis. In the latter case the operation for closure is almost certain to fail unless the patient is first subjected to a long course of anti-syphilitic treatment and placed in a good general condition.

Fecal fistulas of traumatic origin, as a rule, show a decided tendency to heal spontaneously, especially if the parts are kept clean and the sphincter ani muscle is stretched.

The operative prognosis should be guarded in all cases, as infection from the rectum and the mechanic disturbances of the wound which are caused by the accumulation of feces or gas in the rectum, as well as the act of defecation, may jeopardize the most skilfully performed operation and cause it to be a failure.

Treatment.—The treatment of fecal fistulas is divided into the management of (1) recent cases and (2) chronic cases.

Recent Cases.—An effort should always be made to bring about a spontaneous closure of the fistula by means of local cleanliness and the proper care of the bowels. The vagina should be irrigated three or four times daily with a quart of hot boric acid solution (℥ij to the quart) and the bowels regulated by an occasional purgative dose of citrate of magnesia and the daily administration of a simple laxative followed by a rectal enema of soapsuds and warm water. As the sinus lessens in size it should be stimulated once a week with the solid stick of nitrate of silver or pure nitric acid.

The above treatment is often successful in healing a small traumatic fistula, and it should be continued for two or three months, or even longer if the opening shows a tendency to close.

Chronic Cases.—The management of chronic fistulas is divided into (*a*) the operative treatment and (*b*) the treatment of inoperable cases.

Operative Treatment.—This consists in denuding the edges of the fistula and approximating them with sutures in the same way as in closing a vesicovaginal fistula.

Preparation of the Patient.—The patient is prepared in the same manner as for an ordinary plastic operation (see p. 830), except that a boric acid solution (℥ij to the quart) is substituted for the corrosive sublimate solution to cleanse the vagina and the bowels.

Three days before the operation the bowels are flushed out with a purgative dose of citrate of magnesia followed by a large rectal enema of soapsuds and warm water, and then opened daily with a mild laxative. On the evening before the day of operation the patient is given a bottle of citrate of magnesia, and on the following morning a rectal enema (*soapsuds and warm water*) is administered. The diet during the three days of preparation should be liquid in character in order to leave as little residual matter in the intestines as possible and thus lessen the danger of excrementitial material accumulating in the rectum.

Position of the Patient.—The patient is placed in the dorsal position.

The *number of assistants*, the *dressings*, and the *list of instruments* are the same as in the operation for the closure of a vesicovaginal fistula (see p. 759).

Operation.—The first step in the operation is to paralyze the sphincter ani muscle by stretching the anus in order to prevent the collection of gas and feces during the process of healing. The vagina and the rectum are then douched with boric acid solution and thoroughly dried with a gauze sponge held in the grasp of the dressing forceps. The rectum above the fistula is then packed with a strip of sterile gauze to keep back the fecal matter and prevent it from infecting the field of operation.

The edges of the fistulous opening are denuded and sutured in precisely the same way as in closing a vesicovaginal fistula; the rectal tampon removed; the vagina irrigated with a solution of corrosive sublimate (1 to 2000) and wiped dry; and a loose gauze tampon inserted into the vaginal canal.

Special Directions.—The same precautions must be taken in making the denudation and in introducing the sutures as are mentioned in the operation for repairing a vesicovaginal fistula.

After-treatment.—Care of the Wound.—The vaginal tampon is removed at the end of twenty-four hours and not re-introduced. The vagina is then irrigated once a day with a quart of corrosive sublimate solution (1 to 2000), followed immediately by a pint of hot sterile water.

Bladder.—The use of a catheter is unnecessary, and the patient should be encouraged to void her urine naturally.

Bowels.—The bowels should be moved every day after the first forty-eight hours with half a bottle of citrate of magnesia or a mild laxative pill. Rectal enemata are contraindicated, as they distend the bowel and mechanically interfere with the wound. If the sphincter ani muscle has been thoroughly paralyzed, there is no tendency toward the collection of flatus, and it passes freely out of the anus without causing distention. If, however, the muscle has not been properly stretched and gas accumulates in the rectum, a tube should be passed into the bowel just beyond the internal sphincter three or four times a day, or as often as may be necessary.

Diet.—During the first week a liquid diet (p. 106) is given, and then a soft diet (p. 111) until the patient gets out of bed, after which time she is placed on a convalescent diet (p. 114).

Position of the Patient.—It is unnecessary to keep the patient in one

position for any length of time, and she may therefore lie either upon her back or upon her side.

Removal of the Sutures.—The sutures are removed on the eighth day and care taken to avoid traction upon the line of union in withdrawing them from the tissues (see vesicovaginal fistula, p. 762).

Getting Out of Bed.—The patient should remain in bed for two weeks and then be kept in her room for seven days before going out-of-doors.

Treatment of Inoperable Cases.—The vagina should be irrigated two or three times daily with boric acid solution (℥ij to the quart); the diet regulated so as to leave the smallest amount of residual matter in the intestines; the bowels evacuated thoroughly once a day to avoid the constant presence of feces in the rectum; and a hot sitz-bath should be taken at bedtime to prevent local irritation occurring about the vulva.

RECTOPERINEAL FISTULA.

Definition.—In this variety of fistula the sinus begins in the rectum and opens anywhere on the perineum from the vulvovaginal orifice to the anus.

Treatment.—These fistulas are difficult or impossible to denude, and hence they must first be converted into a median tear involving the sphincter ani muscle before an attempt can be made to close them. This is accomplished by

Fig. 670.—Rectoperineal Fistula.

Fig. 671.—Operation for the Repair of a Rectoperineal Fistula.

introducing a grooved director along the fistula into the rectum and bringing its tip outside of the anal opening. The intervening structures, which include the sphincter muscle, are then divided with a bistoury and the exposed sinus tract denuded along its entire course down to, but not including, the rectal mucosa. The wound is then united with sutures in a similar manner to that employed in

an operation for the repair of a median tear of the perineum involving the sphincter ani muscles (see p. 789).

After-treatment.—The subsequent treatment of the case is the same as that described in median tears involving the sphincter ani muscle.

RECTOLABIAL FISTULA.

Definition.—In this variety of fistula, which is usually the result of an abscess, the sinus begins some distance up the rectum and opens on the inner side of the labium majus.

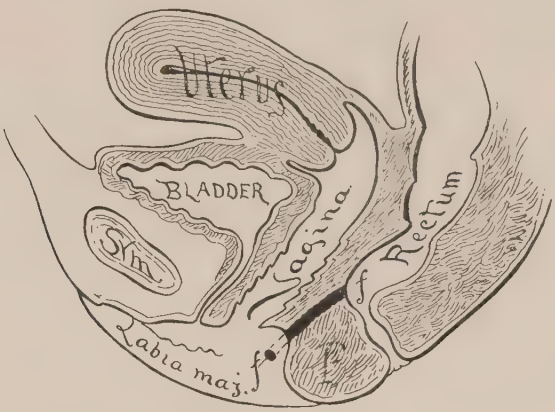


Fig. 672.—Rectolabial Fistula.

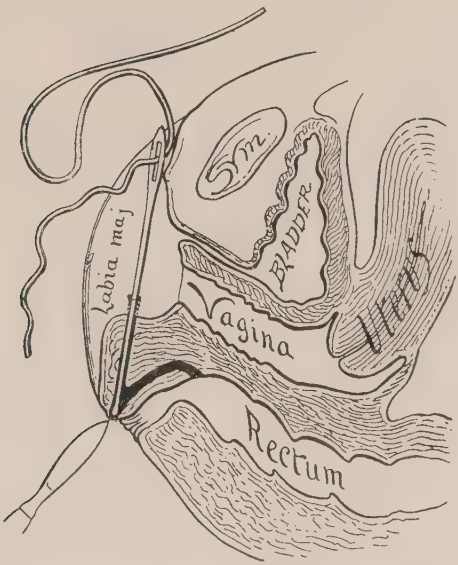


Fig. 673.—Operation for the Repair of a Rectolabial Fistula (page 774).
Shows the tip of a stiff probe making pressure through the perineum and an incision being made through the tissues.

Treatment.—The object of the treatment is to convert the rectolabial sinus tract into an ordinary anal fistula by means of an elastic ligature. This

is accomplished by first introducing a stiff silver probe, threaded with a long, narrow, elastic, rubber ligature, a short distance beyond the labial opening and directing its tip downward against the perineum just beyond the external edge of the sphincter ani muscle. An incision is then made through the tissues over the probe, which is liberated and withdrawn along with one end of the ligature (Fig. 673).

A flexible probe is now threaded with the other end of the ligature and passed through the labial opening into the rectum, where its tip is bent forward and directed out through the anus. One end of the ligature now protrudes through the anus and the other through the incision in the perineum, thus leaving the

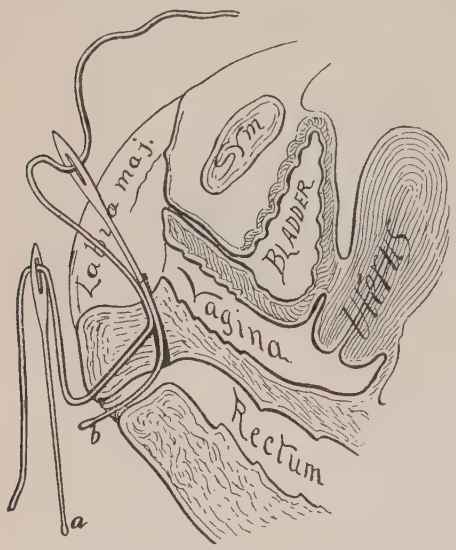


Fig. 674.

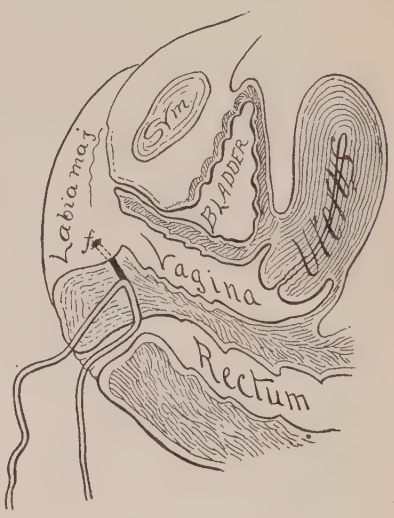


Fig. 675.

Operation for the Repair of a Rectolabial Fistula.

Fig. 674 shows the ligature attached to the stiff probe drawn through the opening in the perineum (*a*) and the other end of the ligature being carried on a flexible probe through the fistula into the rectum and out of the anus (*b*); Fig. 675 shows one end of the ligature protruding from the anus and the other end from the incision in the perineum.

labial end of the sinus tract entirely free and changing the abnormal communication to a simple *fistula in ano*. Both ends of the ligature are now drawn taut and tied, and the labial end of the original sinus left to itself.

After-treatment.—It is unnecessary to confine the patient to bed, as there is but little pain or discomfort following the operation. As a rule, the ligature cuts its way through in from six to eight days, and if the pressure becomes relaxed before the process is completed the remaining tissues are readily divided with scissors.

The labial opening usually closes in from one to two weeks.

ENTEROVAGINAL FISTULA.

Definition.—In this variety of fistula there is an abnormal communication between the intestine and the vagina.

Treatment.—If the fistula is small and the lower part of the bowel is patulous, an effort should be made to close the opening by denudation and suturing in a manner similar to that already described in the treatment of a recto-

vaginal fistula. A large fistula or one that is associated with occlusion of the lower end of the intestine should be treated by opening the abdomen, separating

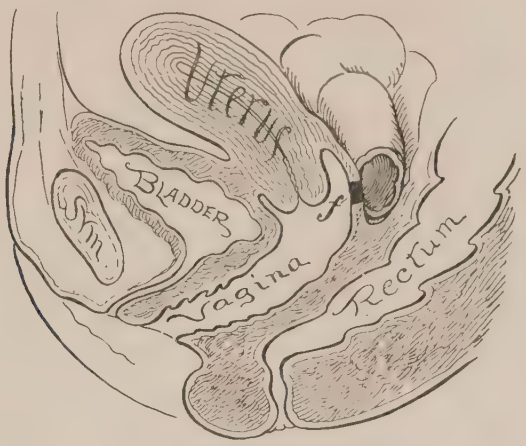


Fig. 676.—Enterovaginal Fistula (*f*).

the bowel from the vagina, and repairing the lesions according to the indications present.

CHAPTER XXXVII.

STERILITY.

Definition.—By sterility we mean an inability upon the part of a woman to produce a living child. This definition therefore includes not only women who cannot conceive, but also those who become pregnant and habitually abort before the period of viability.

Sterility may be either *primary* or *secondary*. It is called primary when a woman has never conceived, and secondary when she has borne one child.

Causes.—It is estimated that about one marriage out of every eight or ten is childless, and until modern times it was generally believed that the cause was due almost entirely to the wife. Recent investigation, however, has determined the fact that the husband is often either directly or indirectly at fault, and it is therefore necessary to consider the possibility of the male being sterile in all cases in which marriage is not followed by offspring.

Sterility in the Male.—The most frequent causes of sterility in the male are (*a*) a lack of erectile power of the penis (*impotency*); (*b*) an absence of spermatozoa in the semen (*azoöspermia*); (*c*) a deficient secretion of seminal fluid (*aspermia*). In addition to these direct causes of sterile marriages, the male may infect the female with gonorrhea, and thus indirectly be responsible for the barrenness which results from specific diseases of the uterus and its adnexa.

We are probably not far from the truth in stating that one out of every six childless marriages is due to the absence of spermatozoa in the semen or inability on the part of the male to properly perform the act of copulation; and if we also include those women who become sterile from gonorrheal infection, the propor-

tion will be about one to four in which the husband is responsible for the infecundity.

Sterility in the Female.—The essential factors in procreation, so far as the female is concerned, are (*a*) the presence of an ovum, (*b*) the capacity for copulation, (*c*) normal secretions, and (*d*) a healthy endometrium upon which the product of conception can lodge and develop. Sterility is *physiologic* prior to the period of puberty, during lactation, and subsequent to the menopause, and it is not uncommon for women to cease bearing children several years before the change of life actually occurs.

The causes of sterility may be either *congenital* or *acquired*, and they may involve any organ of generation or portion of the genital tract from the vulva to the fimbriated extremities of the Fallopian tubes. In addition to the local causes of sterility, the general condition of the patient is at times responsible for the absence of conception, and it is not uncommon for women who are suffering from some constitutional affection to remain barren for an indefinite period.

The Vulva.—*Congenital Causes.*—Absence of the vulva acts as a mechanic obstacle to copulation, and therefore prevents insemination.

Acquired Causes.—Tumors of the vulva and elephantiasis prevent intercourse from taking place, and in cases of urethral caruncle, kraurosis, inflammation, or other painful local conditions it is rendered impossible on account of the pain which results.

The Vagina.—*Congenital Causes.*—Sterility may result from absence or atresia of the vagina and from a transverse septum which is sometimes found in the upper part of the canal. The vagina may also be abnormally short and unable to retain the semen. In some cases the hymen is at fault, and it is found to be imperforate or so thick and elastic that coitus takes place without rupturing it.

Acquired Causes.—Atresia or occlusion of the vagina resulting from a severe inflammation or a faulty operative technic is sometimes a cause of sterility. The hyperacid discharge caused by a vaginitis is likely to destroy the spermatozoa, and thus prevent conception from occurring. The toxins which are produced by the urine that accumulates in the vagina in cases of genito-urinary fistulas act in the same way. Inflammatory conditions and vaginismus render intercourse impossible on account of the pain or spasm which they cause, and vaginal tumors act as an obstruction to the entrance of the penis.

The Uterus.—*Congenital Causes.*—The following congenital malformations result in sterility: Displacements, absence of the uterus, atresia, a conoidal cervix, and an infantile or a rudimentary uterus.

Acquired Causes.—Sterility is frequently of uterine origin, and the most common causes of barrenness, next to diseased conditions occurring in the Fallopian tubes and ovaries, are found in the uterus.

Endometritis is often a cause of sterility on account of the discharges which accompany the disease and the altered character of the uterine mucous membrane. Under these circumstances the spermatozoa are usually destroyed by the discharges and conception does not occur; or if pregnancy does take place, abortion follows, as a rule, as the fertilized ovum cannot become securely attached to the uterine mucosa, which has undergone pathologic structural changes. In cases of endocervicitis the mucous membrane of the body of the uterus is usually also inflamed, and sterility not only follows as the result of this condition, but the cervical canal may become plugged with thick mucus and prevent the entrance of spermatozoa into the uterine cavity. Subinvolution itself does not usually cause sterility, but the coexisting endometritis and the frequent presence of tubo-ovarian inflammation are often responsible for the infecundity which accompanies the affection.

Well-marked flexions of the uterus are often associated with sterility. In these cases, however, the lack of fecundity is not due to the flexed condition of the uterus, but to the accompanying endometritis, which is associated with a profuse discharge and an altered condition of the mucous membrane. We often meet young women in whom the uterus is sharply bent anteriorly, and who suffer from a severe form of obstructive dysmenorrhea, becoming pregnant soon after marriage. These cases demonstrate the fact that a flexion itself is not capable of preventing conception, and that sterility does not occur until the mucous membrane becomes pathologically altered by the long-continued presence of the distortion.

Uncomplicated cases of retroversion of the uterus very seldom, if ever, result in sterility, and when infecundity does occur, the cause is usually found to be due to adhesions, tubal disease, or a coexisting endometritis. Fibroid tumors in some instances may mechanically prevent the entrance of spermatozoa into the uterine cavity, but, as a rule, the infecundity is due to the accompanying endometritis and not to the presence of the neoplasm. If conception occurs in these cases, the fertilized ovum usually becomes dislodged and abortion follows.

Hypertrophic elongation of the cervix, stenosis of the cervical canal, and lacerations of the cervix are not infrequently accompanied by sterility, and, as a rule, the infecundity is due to the coexisting endometritis, and not to the presence of the lesion. Atresia of the cervical canal resulting from a faulty operative technic or the application of strong acids is, of course, a positive obstacle to the ingress of spermatozoa.

Hyperinvolution of the uterus usually causes sterility, and if the uterine cavity measures less than two inches the case is hopeless. Malignant disease of the body of the uterus is seldom associated with pregnancy; involvement of the cervix, on the other hand, is not, as a rule, a barrier to conception in the early stages of the disease, and if gestation occurs it may continue to full term.

The Fallopian Tubes.—*Congenital Causes.*—In some cases sterility is due to the tubes being absent, and in others their development is rudimentary or defective. Sometimes the oviducts have an abnormal number of convolutions, or they are excessive in length, which interferes with the passage of the ovum and the ingress of the spermatozoa.

Acquired Causes.—The oviducts play a very important rôle in the processes of conception, as they are the channels through which the ova are conveyed to the uterus, and even the most trivial interference with this function often results in permanent sterility. We therefore find that pathologic conditions of the Fallopian tubes are the most common causes of infecundity, and that women who are apparently normal fail to conceive on account of some slight tubal affection which can only be detected after the abdomen is opened at the time of an operation.

Salpingitis or inflammation of the oviducts is responsible in the majority of instances for the structural changes which take place in the organs and destroy their function. These changes are usually due to either gonorrheal or septic infection; the former being a frequent cause of cases of primary sterility occurring in young married women who have become infected by their husbands with a latent form of the disease. The changes which result in sterility may affect either the serous, the muscular, or the mucous coat of the oviducts, and they vary from slight or unimportant conditions to extensive degenerations which cause complete destruction of all the tissues.

Adhesions involving the serous coat are very common, and they are probably

a frequent cause of sterility They may pass across the tube and occlude its caliber or bind it down in a tortuous or kinked position; again, they may cause fixation and prevent the abdominal end of the oviduct from coming in contact with the ovary; and, finally, they may obliterate the tubal opening by agglutinating its fimbriated extremity.

Inflammation of the muscular coat interferes with the peristaltic action of the oviduct and tends to prevent the ovum from passing into the uterus.

The pathologic changes occurring in the mucous lining of the tubes are the most frequent causes of sterility, and they are very apt to be present in both the acute and chronic forms of salpingitis. Acute catarrhal salpingitis may result in temporary sterility on account of the swollen condition of the mucous membrane, and if resolution takes place the function of the tube is restored as the swelling subsides. Chronic salpingitis is very liable to produce desquamation of the ciliated epithelium and cause sterility. This is due to the fact that the function of the cilia is to carry the tubal contents toward the uterus, and if they are destroyed the passage of the ovum through the oviduct is prevented. Under these circumstances the ovum either dies and sterility results, or it becomes fertilized and an ectopic or tubal pregnancy follows. Inflammation of the mucous membrane of the oviduct may produce a permanent closure of its abdominal or uterine opening or both, and thus cause an insurmountable barrier to conception. These changes are often associated with a collection of serum or pus (*hydrosalpinx* and *pyosalpinx*), and the tubal structures are usually so completely degenerated that the function of the oviduct is forever destroyed. And, finally, salpingitis may be accompanied by an acrid tubal secretion which is hostile to the spermatozoa and ova and causes their destruction.

In rare instances the presence of a tubal neoplasm obstructs the lumen of the oviduct and causes sterility.

The Ovaries.—*Congenital Causes.*—Sterility may result from an absence or a rudimentary condition of the ovaries.

Acquired Causes.—The ovaries may be bound down by adhesions in such a position that the fimbriated extremities of the oviducts cannot come in contact with them, or they may be so imbedded in inflammatory exudates that the ova cannot escape from the ruptured follicles. Sometimes the ovaries may be simply displaced without adhesions being present, and sterility results from this cause alone. Inflammation of the ovary may produce atrophy and the organ become sterile or incapable of maturing ova. It may also result in thickening of the surface of the ovary and prevent the Graafian follicles from rupturing. And, finally, cystic or solid tumors of the ovary are usually attended with sterility.

General Causes.—Constitutional disturbances are not an infrequent cause of sterility, and it is more or less common to meet barren women in whom the pelvic organs are apparently normal. In estimating the effect of the general causes upon sterility we must always bear in mind, however, the possibility of some undetected or trivial tubal lesion being responsible for the condition; otherwise we may place too much importance upon the former and arrive at an incorrect diagnosis. Great obesity is one of the most frequent causes of infecundity, and women who rapidly accumulate fat soon after marriage seldom have more than one or two children. Sterility may be caused by anemia, especially when it is attended with adiposis, and it may also be associated with lithemia, chlorosis, diabetes, and chronic renal inflammation. Women suffering from chronic alcoholism, tuberculosis, and cancer are not liable to conceive, and abortions are very apt to occur when the constitution is affected with syphilis. Women who masturbate are usually sterile.

Curious instances have been observed in which a divorce has followed after several years of barren wedlock, and the husband marries a second wife and the wife a second husband, and both marriages are followed by offspring. The cause of the sterility in these extraordinary cases is not known, and it can only be attributed to an indefinable sexual incompatibility between the husband and wife.

Diagnosis.—The diagnosis is based upon the recognition of the cause. In cases of *primary* sterility the investigation must include both the husband and the wife, as the former may be at fault or the latter may have an acquired or congenital condition which will explain the infecundity. In cases of *secondary* sterility, however, the investigation is limited to the acquired causes in the wife, as the fact of her having borne a child would necessarily exclude the husband or the congenital causes from being responsible for the sterility.

The Husband.—The physician should not have any false modesty about questioning the husband concerning the sexual act, as it is unfair to the wife to subject her to an examination and treatment unless it is certain that she is responsible for the lack of offspring. We should, therefore, question the husband as to the erectile power of his penis and his ability to properly perform the sexual act. In some cases complete impotency exists and penetration is impossible; in others the ejaculation may occur before the penis is introduced into the vagina; and, finally, the organ may become flaccid without ejaculation soon after penetration. We should also ascertain whether the husband has ever contracted syphilis or gonorrhea; and if he has had the latter disease, whether there was a gleety discharge present at the time of his marriage. Under these circumstances a microscopic examination should be made of the urethral secretions in order to discover, if possible, the presence of gonococci. The penis should be examined and the position of the external meatus determined, as cases of sterility have been observed which were due to a hypospadias. And, finally, a microscopic examination must be made of the seminal fluid to ascertain the presence or absence of spermatozoa. The semen is collected as follows: The husband has connection with his wife with a condom, which is immediately placed in a bottle and sent to his physician, who examines the semen at once. If no spermatozoa are found in the seminal fluid by the microscope, the sterility is due to azoöspermia, and it is therefore unnecessary to subject the wife to an examination or treatment.

The Wife.—A thorough examination must be made of the genital tract from the vulva to the ovaries to ascertain the presence or absence of any of the acquired or congenital causes of sterility. The general causes must also be considered and a careful investigation should be made of the entire system.

It is important in all cases, as a routine practice, to determine the reaction of the vaginal and uterine discharges, as they are not infrequently so altered in character that they destroy the spermatozoa and cause sterility. These secretions are collected on a probe wound with absorbent cotton and then tested with litmus paper. The vaginal discharges are slightly acid in health, but if hyperacidity exists they are hostile to the spermatozoa. The uterine discharges (*uterotubal*), on the other hand, are alkaline, and an acid reaction is therefore abnormal.

Prognosis.—The prognosis in cases of both primary and acquired sterility is very uncertain and unsatisfactory. In a general way it depends upon the cause, although we cannot promise, even if it is removed, that pregnancy will follow. Congenital causes involving an absence or a rudimentary condition of the reproductive organs are hopeless, and the prognosis is equally bad in many of the acquired causes. Unless the uterus or its adnexa have been removed by a surgical operation pregnancy may occur even in cases in which it seems impossible, and the most extraordinary instances are met from time to time in which

women have conceived after years of barrenness. This is true not only of secondary sterility, but also of the primary form, and it demonstrates the fact that it is possible for pregnancy to occur even in apparently hopeless cases. The physician should therefore be very cautious in expressing an opinion, and under no circumstances should he be led into giving a positive prognosis one way or the other.

In cases of primary sterility the probability of having children is not good if three years have elapsed without conception occurring, although it must be borne in mind that conception not uncommonly takes place after that period. According to carefully compiled statistics, about three-fourths of the women menstruate but once after marriage, and are delivered of a child in the course of the first year. Sometimes, however, perfectly healthy men and women marry and several months elapse before conception occurs.

Treatment.—The treatment is based upon the removal of any local or general cause which may be present.

If the secretions of the vagina are hyperacid, a vaginal injection composed of two drachms of bicarbonate of soda to a quart of warm water (110° F.) should be given immediately before intercourse to counteract the acidity and prevent the destruction of the spermatozoa before they enter the uterine cavity. The injection should be given with the patient in the dorsal position, so that the solution will thoroughly flush out the vaginal culdesac and neutralize the discharges. She then assumes the erect posture and allows the excess of fluid to escape from the vagina. These injections should be employed for an indefinite length of time or until pregnancy results if the treatment is successful.

The entrance of spermatozoa into the cervical canal is undoubtedly facilitated by elevating the hips upon a pillow during the act of copulation, and this postural treatment may therefore be employed as a routine practice in cases of sterility.

Curetment of the uterine cavity should be employed as an empiric plan of treatment in all cases of sterility in which no cause can be discovered to account for the condition. Under these circumstances pregnancy has frequently followed this operation, and as it is devoid of all danger, the patient should be given the benefit of any good results which may ensue.

As stated elsewhere, the most frequent causes of sterility are tubal in origin, and they are often of so trivial a nature that they cannot be detected without performing an exploratory abdominal incision. The question therefore naturally arises as to whether we are justified in advising such an operation in cases in which no cause for the infecundity can be discovered. Personally I am of the opinion that this question must be decided by the patient herself, and if she is willing to run the slight risk to her life that the operation necessarily involves with the hope of having offspring, the surgeon need have no hesitancy whatever in exploring the uterine adnexa through an abdominal opening. The technic of this operation is fully described in the chapter on Conservative Operations upon the Uterine Adnexa on page 572, and therefore need not be discussed here.

CHAPTER XXXVIII.

THE PELVIC FLOOR.

ANATOMY.

Synonyms.—Perineum; pelvic diaphragm; and inferior wall of the pelvis.

Definition.—By the pelvic floor is meant the soft parts which fill up the bony outlet of the pelvis.

Description.—The floor of the pelvis is composed of skin, superficial and deep fascias, and muscles, and is perforated in the female by the rectum, the

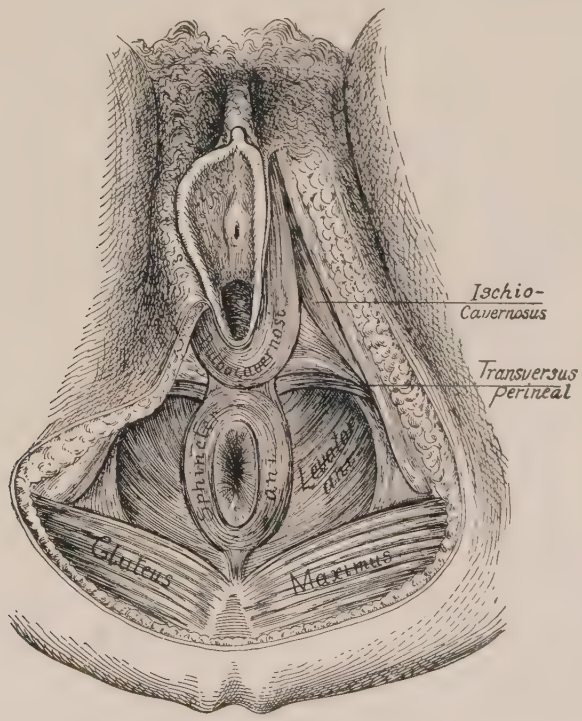


Fig. 677.—Muscles of the Pelvic Floor.

vagina, and the urethra. The rectum alone is closed by a true sphincter, while the anterior and posterior walls of the vagina and the urethra are kept in close apposition principally by the action of the levator ani muscle, which lifts up the lower end of the rectum and flattens out the structures between it and the pubic arch. The action of this muscle is somewhat increased by the contraction of the transverse perineal and bulbocavernosi muscles, which are situated on each side of and below the vagina.

Muscles.—The muscles of the pelvic floor are eight in number, as follows:

Two ischiocavernosi.
Two bulbocavernosi.
Two transverse perineal.
The levator ani.
The sphincter ani.

The Ischiocavernosi Muscles.—These muscles arise on each side from the tuberosity of the ischium and the ischiopubic ramus, and are inserted into the sides and under surface of the crus clitoridis.

Action.—They constrict the crus clitoridis, and by retarding the return of the venous blood assist in maintaining the erection of the organ.

The Bulbocavernosi Muscles.—These muscles arise in the perineum and pass forward, one on each side of the vagina, to be inserted into and around the corpora cavernosa of the clitoris.

Action.—They assist to keep the vulvovaginal orifice closed and also to maintain the clitoris in erection by compressing the dorsal vein.

The Transverse Perineal Muscles.—These muscles arise on each side from the ramus and tuberosity of the ischium and are inserted into the perineum, where they blend with the muscle of the opposite side, the external sphincter ani, the bulbocavernosi, and the levator ani muscles.

Action.—They assist in keeping the vulvovaginal orifice closed.

The Levator Ani Muscle.—It arises on each side from the posterior surface of the body and ramus of the pubes, the spine of the ischium, and the white line of the pelvic fascia, and passes downward and backward to be inserted into the sides and posterior wall of the vagina and into the rectum, where it blends with the muscle of the opposite side, and is finally attached to the tip of the coccyx and the raphé extending from the coccyx to the rectum.

Action.—It supports and compresses the pelvic and abdominal viscera, dilates the anus during the act of defecation, and draws the rectum, the perineum, and the vagina upward under the pubic arch.

The Sphincter Ani Muscle.—It arises from the tip of the coccyx, surrounds the lower end of the rectum, and blends anteriorly in the perineum with fibers of the transverse perineal, bulbocavernosi, and levator ani muscles.

Action.—It closes the lower end of the rectum and assists in the action of the pelvic diaphragm as a whole.

MECHANISM.

The pelvic floor supports and compresses the pelvic viscera and maintains their normal relationship and equilibrium. It also surrounds and holds in position the lower portions of the rectum, the vagina, and the urethra, and enables them to properly perform the functions of defecation, coitus, child-bearing, and micturition.

All the muscles of the pelvic floor blend with each other and form a complete muscular diaphragm, which fills the bony outlet of the pelvis. These muscles are still further strengthened by layers of strong pelvic fascia which bind them together and increase their power. The muscular elements which enter into the construction of the floor are its chief source of strength, and the levator ani is the most important of all the muscles, as the support which is afforded to the pelvic viscera depends entirely upon its integrity.

The pelvic floor does not support the superimposed structures in the sense of being under them and holding them up, as the foundations do the upper stories of a building, but it forms a sling composed of closely interwoven muscles and fascias which is attached to the body and rami of the pubes, and which encircles

the urethra, the vagina, and the rectum. This sling therefore acts in the same way as the ropes of a swing, which are attached to a beam and support a seat which is thrown across the loop near the ground. The pubic bone represents the beam; the urethra, the vagina, or the rectum the seat; and the levator ani muscle the rope.

As we have already seen, the levator ani muscle, on account of its size and the attachment of its fibers around the sides and posterior wall of the urethra, the vagina, and the rectum, forms the chief strength of this sling, in which the terminal portions of these organs are swung. Therefore so long as the integrity of this muscle is maintained the pelvic floor will support the superimposed structures and the equilibrium of the pelvic organs will remain normal. The moment, however, the muscle is torn the sling is destroyed, and the pelvic organs will sag downward and backward, just as a child would drop to the ground if the ropes of a swing were cut.

Now let us study for a moment the effect that this sling-like action of the levator ani muscle has upon the pelvic viscera and the lower ends of the rectum, the vagina, and the urethra. If we place a nulliparous woman in the dorsal position, we will note the following conditions: The anus and vulvovaginal outlet are drawn well up under the pubic arch, the anal opening is more or less retracted, and the so-called perineum is somewhat convex. Separating the labia, we notice that the anterior and posterior walls of the vagina are in close contact, and that when the woman bears down they are firmly forced against each other without, however, showing any tendency to roll out of the vaginal outlet. At the same time the perineum becomes more prominent or convex and the distance between the anus and the fourchette is increased. If the woman is now told to draw in or contract the muscles of the pelvic floor, the levator ani lifts the anus further up under the pubic arch than normal, crowding the anterior and posterior walls of the vagina against each other and decreasing the length of the perineum.

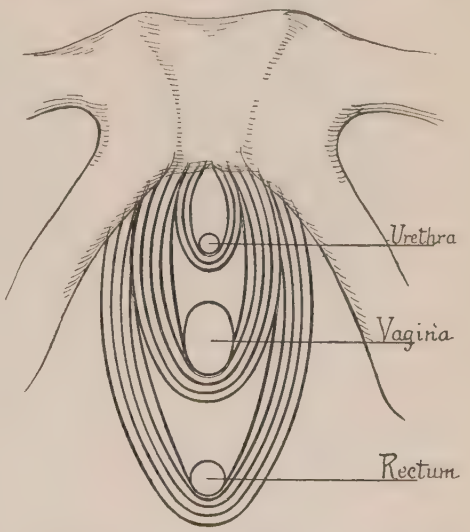


FIG. 678.—MECHANISM OF THE PELVIC FLOOR.
Shows the sling like action of the fibers of the levator ani muscle which encircle the urethra, the vagina, and the rectum.

If the index-finger is passed into the vagina, we can trace a broad elastic band of muscular tissue from the body and rami of the pubes downward on each side of and below the vagina, which becomes tense and rigid when the woman contracts the muscles of the floor. The anatomic connection of this muscular sling with the rectum can also be demonstrated by making pressure with one index-finger in either vaginal sulcus and the other in the anal canal while the woman contracts and relaxes the muscles. Under these circumstances the muscular band becomes alternately rigid and relaxed, and we can realize by the sense of touch that the rectum and the vagina are actually pulled up toward the pelvic arch, just as if a flat cord was placed under them and its free ends drawn up.

PUERPERAL INJURIES.

Classification.—Injuries of the pelvic floor are classified according to their situation and extent as follows:

Superficial median tears.
Median tears involving the sphincter ani.
Lateral tears involving the vaginal sulci.

Superficial Median Tears.—This variety of laceration extends in the median line from the fourchette either backward toward the anus or upward into the vagina or both. It splits the tissues between the posterior border of the vulvovaginal orifice and the anus, and in some cases it may extend internally an inch or more up the posterior wall of the vagina.

FIG. 679.—SUPERFICIAL MEDIAN TEAR OF THE PELVIC FLOOR.
Shows a tear extending backward toward the anus and upward into the vagina.

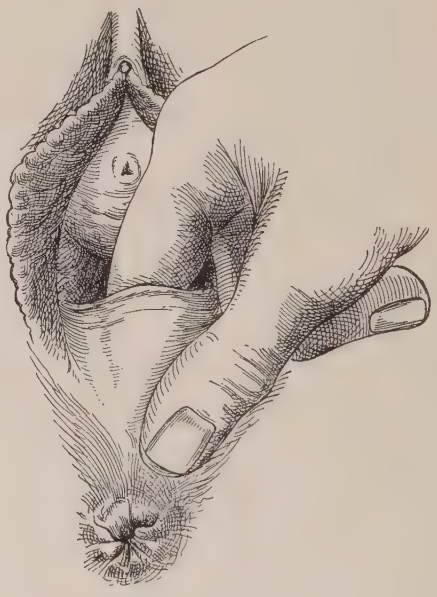


FIG. 680.—DIAGNOSIS OF A SUPERFICIAL MEDIAN TEAR OF THE PELVIC FLOOR.
Shows the method of estimating the loss of perineal tissue.

Results.—These tears are of no practical importance, as the integrity of the levator ani muscle is not damaged nor destroyed, and hence the supporting power of the pelvic floor remains unimpaired. Sometimes, however, the cicatrix which is formed may become irritable and cause local tenderness and reflex disturbances.

Diagnosis.—A *recent tear* can be readily recognized by separating the labia and inspecting the parts. The presence of the laceration can thus be ascertained and its situation and extent determined.

An *old tear* is recognized by the loss of tissue between the vulvovaginal outlet and the anus, the split in the fourchette, and the presence of scar tissue in the perineum. The loss of perineal tissue can be estimated by introducing the index-finger into the vagina and placing the thumb externally over the peri-

neum with its tip on a level with the anterior margin of the anus and compressing the structures between them. In this way a so-called *skin perineum* can be readily discovered and the true nature of the tear determined (Fig. 680).

Median Tears Involving the Sphincter Ani.—This variety of laceration extends backward in the median line from the fourchette through the sphincter ani muscle, and in some cases it may continue up the rectovaginal septum for a distance of an inch or more. Sometimes all the fibers of the sphincter are not completely divided and the appearance of the tear may be deceptive.

Results.—These tears permanently destroy the function of the sphincter muscle and cause incontinence of feces and gas. If the fibers of the sphincter are not completely divided, the patient may have control over solid feces, but she cannot prevent the involuntary escape of flatus or liquid material. A chronic diarrhea often accompanies a laceration involving the rectovaginal septum.

The levator ani muscle is not torn, and hence the supporting power of the pelvic floor remains unimpaired.

Diagnosis.—A *recent tear* is readily recognized by *inspection* and *touch*. If the labia are separated and the parts inspected, a laceration will be seen beginning at the vulvovaginal orifice and extending through the perineum into the rectum. The anal ring will be absent and there will be an eversion of the rectal mucous membrane. In case of doubt the index-finger should be introduced into the anal canal, and if the muscle is torn there will be a complete absence of a sphincter action at the terminal end of the rectum.

An *old tear* is also recognized by *inspection* and *touch*. The anal ring is absent and the torn ends of the muscle are retracted and only encircle the posterior margin of the anus. The rectal mucosa is everted, and if the tear has extended up the rectovaginal septum the rectum and vagina open into a common outlet. No resistance is offered when the index-finger is introduced into the anal canal, and the sphincter action is also absent.

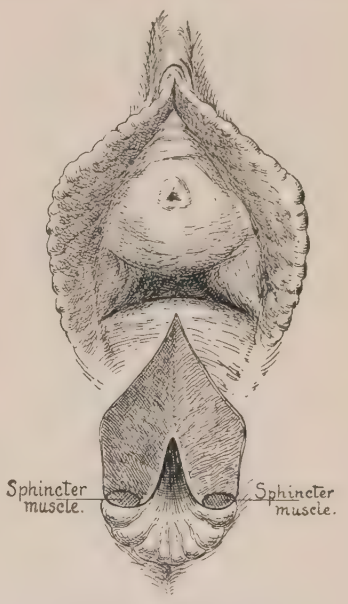


FIG. 681.—MEDIAN TEAR OF THE PELVIC FLOOR INVOLVING THE SPHINCTER ANI MUSCLE.
Note the torn ends of the sphincter ani muscle and the absence of the anal ring.

Lateral Tears Involving the Vaginal Sulci.—This variety of laceration extends from the fourchette up into one or both of the vaginal sulci and is usually accompanied by a superficial median tear toward the anus.

As a rule, the laceration is bilateral, the left sulcus being more deeply torn than the right, and in rare cases the injury may occur on only one side of the vagina; it is the exception for the sphincter ani muscle to be involved. These tears extend on each side of the vagina toward the ischiorectal fossa, dividing the fibers of the levator ani muscle and lacerating the fascias and small muscles opposite the lateral margins of the vaginal outlet.

Results.—The function of the levator ani muscle is destroyed, and the pelvic organs, as well as the terminal ends of the urethra, the vagina, and the rectum, are no longer supported or maintained by the pelvic floor. The torn

muscles gradually retract and eventually undergo atrophy from disuse, and if the repair of the laceration is indefinitely delayed, they never regain their full power or strength. As a rule, involution of the uterus and the vagina is arrested, and eventually the uterine ligaments as well as the pelvic connective tissue become elongated and stretched, resulting in prolapse of all the organs of the pelvis. These changes become permanent in time, and even if the injury is finally repaired, the uterus will not remain in its normal position unless a fixation operation is performed to correct the prolapse. When the tear only involves one of the vaginal sulci, there is less liability of the pelvic organs becoming prolapsed, and the muscle on the uninjured side partially sustains the superimposed structures.

Diagnosis of a Recent Tear.—A recent tear is readily detected by separating the labia and inspecting the posterior vaginal wall with a good light. Under these circumstances the examiner will observe a deep ragged

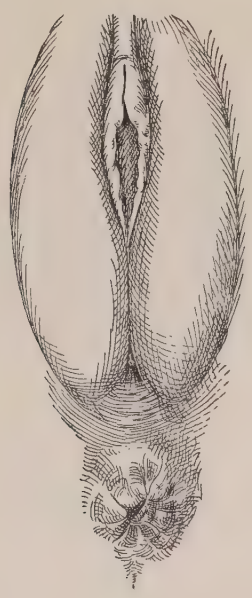


Fig. 682.

Fig. 683.

Diagnosis by Inspection of Lateral Tears of the Pelvic Floor Involving the Vaginal Sulci.
Fig. 682 shows a nulliparous vulva; Fig. 683 shows the appearance of a vulva resulting from lateral tears involving the vaginal sulci.

laceration occupying one or both of the vaginal sulci, which converge at the posterior margin of the vaginal outlet and continue backward as a single tear in the median line toward the anus.

Diagnosis of an Old Tear.—The diagnosis is based upon the physical signs, which may be elicited by (*a*) inspection and (*b*) palpation.

Inspection.—Placing the patient in the *dorsal position* we note that the vulva is relaxed, the labia separated, the vaginal orifice patulous, and the anterior and posterior walls of the vagina are not in apposition. The perineum is flat and usually longer than normal, and it is not uncommon in these cases to find that the fourchette is intact. The anal ring is prominent and the rectal mucosa is frequently found to be everted. The rectum is displaced toward the coccyx and the anus is more or less relaxed. If the woman is now made to contract the

muscles of the pelvic floor, the anus and the vaginal opening are not drawn up toward the pubic arch and the anterior and posterior walls of the vagina are not crowded against each other. When she bears down, however, the vagina rolls out and exposes the lower portion of the canal.

Palpation.—When the index-finger is introduced into the vagina, the sling of muscular tissue is found to be absent, and the structures around the vaginal sulci remain soft and yielding even when the muscles are contracted, showing that the supporting band has been destroyed. By careful palpation we may be able to feel the relaxed and torn muscles hanging parallel to the lateral walls of the vagina, and if the injury is unilateral the oblique direction of the uninjured muscle is in marked contrast to that of the opposite side.

Treatment.—Injuries of the pelvic floor demand surgical treatment, and the operative technic in each case is based upon the duration and the character of the tear.

I shall therefore consider the subject under the following headings:

Primary operations.

(*a*) Superficial median tears.
(*b*) Median tears involving the sphincter ani.
(*c*) Lateral tears involving the vaginal sulci.

Intermediate operations.

Secondary operations.

(*a*) Superficial median tears.
(*b*) Median tears involving the sphincter ani.
(*c*) Lateral tears involving the vaginal sulci.

FIG. 684.—DIAGNOSIS BY PALPATION OF LATERAL TEARS OF THE PELVIC FLOOR INVOLVING THE VAGINAL SULCI.

Shows the tip of the index-finger palpating the left vaginal sulcus.

Primary Operations.—A primary or an immediate operation is performed within the first twenty-four hours after labor.

Indications.—A primary operation is always indicated, as the torn structures can be more accurately approximated immediately after labor than at a later period. The danger of infection is also removed and the patient is saved from the serious results which often follow in neglected cases. And, finally, if the operation is indefinitely delayed, the muscles retract and undergo atrophy and never regain their normal strength even after the tear is repaired.

Contraindications.—The condition of the patient from loss of blood or other causes may render it inadvisable to disturb her immediately after labor, and consequently the primary operation should not be performed.

Anesthesia.—The parts are so benumbed immediately after labor that an anesthetic, as a rule, is not required unless the patient is nervous or uncontrollable. A general or local anesthetic, however, should always be employed if the operator finds that he cannot properly perform the operation without it, or when the laceration is extensive and involves important structures.

Preparation of the Patient.—No preliminary preparation is required.

Position of the Patient.—The patient should be placed in the dorsal position, either crosswise on the bed (see p. 20) or on a kitchen table (see p. 21), with a surgical pad under her hips. The latter position is always preferable if the patient is strong enough to be moved, especially when operating upon lacerations involving the sphincter ani muscle or the vaginal sulci.

Superficial Median Tears.—The repair of these lacerations is conducted as follows:

Sponges; Dressings; Solutions; etc.—Two dozen gauze sponges, four large gauze pads, a gauze compress, a T-bandage, a solution of corrosive sublimate (1 to 2000), and hot and cold sterile water or normal salt solution.

Instruments.—(1) Right and left Emmet slightly curved scissors; (2) tissue forceps; (3) dressing forceps; (4) needle-holder; (5) two short hemostatic forceps; (6) shot compressor; (7) two small full-curved Hagedorn needles; (8) two perineal needles (Emmet's); (9) silkworm-gut—20 strands; (10) perforated shot.

Assistants.—An anesthetizer (if necessary) and two assistants.

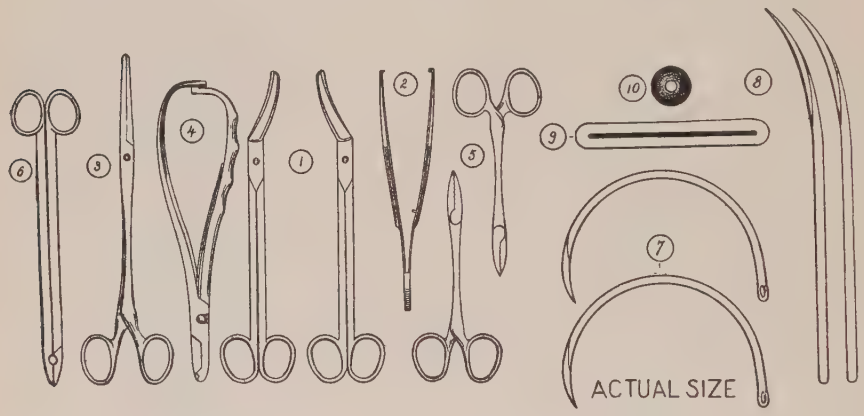


Fig. 685.—Instruments, Needles, Suture Material, and Perforated Shot Used in the Primary Operation for the Repair of a Superficial Median Tear of the Pelvic Floor.

Technic.—After placing the patient in the proper position the assistants separate the labia and expose the posterior wall of the vagina, the vulvar canal, and the perineum.

The operator then dips a sponge into the solution of corrosive sublimate and squeezes the fluid over the parts. After drying them he unfolds a gauze pad and tampons the upper part of the vagina to temporarily keep back the discharges that would necessarily flow over the seat of operation and obscure the view. The tear is then carefully inspected, and if its edges are ragged or uneven, they should be trimmed smooth with scissors, otherwise union by first intention may be prevented.

If the tear extends up in the vagina as well as backward toward the anus, the sutures should be introduced as follows: The first suture should be passed near the upper or vaginal angle of the wound by introducing the needle about one-fourth of an inch from the edge of the tear. It should then be carried outward so as to include a thick wedge of tissue and made to emerge at the bottom of the wound. It is then reintroduced near the point of exit and brought out

through the mucous membrane on the opposite side of the tear. Similar sutures are then placed about one-fourth of an inch apart down to the lower or perineal angle of the wound.

The seat of operation is now douched with the corrosive sublimate solution followed by sterile water; the sutures shotted, beginning at the upper angle of the tear; and the tampon removed from the vagina. The free ends of the external sutures are cut off about one-half of an inch beyond the shot and the internal sutures are tied together and pushed up into the vagina out of the way. A gauze compress secured by a T-bandage is finally placed over the vulva and the patient put back in bed.

After-treatment.—*Care of the Wound.*—The vulvar canal should be douched twice a day with a solution of corrosive sublimate (1 to 2000), followed

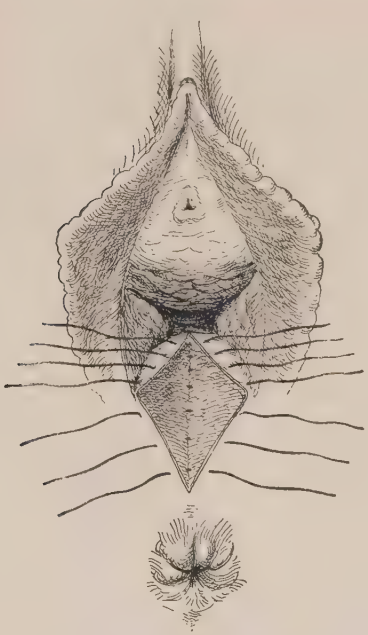


Fig. 686.

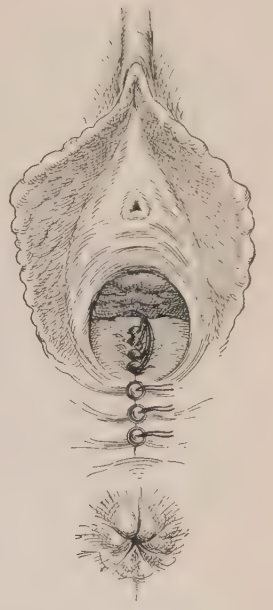


Fig. 687.

Primary Operation for the Repair of a Superficial Median Tear of the Pelvic Floor.
Fig. 686 shows the sutures introduced; Fig. 687 shows the sutures shotted.

by sterile water or normal salt solution, and the gauze compress changed as often as required. The stitches should be removed on the eighth day. It is unnecessary to keep the knees tied after the patient recovers from the anesthetic, and she may be allowed to lie on her side or move from one position to another.

Bowels.—The bowels should be moved daily by a mild laxative.

Bladder.—The use of a catheter should be avoided if possible on account of the danger of causing cystitis.

Getting Out of Bed.—The patient should remain in bed two weeks.

Median Tears Involving the Sphincter Ani.—The repair of these lacerations is conducted as follows.

Sponges; Dressings; Solutions; etc.—The same as are used for the repair of a superficial median tear.

Instruments.—The same as are used for the repair of a superficial median tear.

Assistants.—An anesthetizer (if necessary) and two assistants.

Technic.—After placing the patient in the proper position an assistant stands on each side and separates the labia and exposes the laceration.

The operator now douches the parts with sterile water or normal salt solution and *packs the upper part of the vagina with a gauze pad to keep back the discharges*. The laceration is then carefully inspected and all uneven or ragged edges trimmed away with scissors.

The next step in the operation is to close the superficial median tear and the rectovaginal septum with interrupted silkworm-gut sutures. The first septal suture is introduced through the vaginal mucous membrane at the upper angle of the wound about one-fourth of an inch from the edge of the tear and made to emerge at the

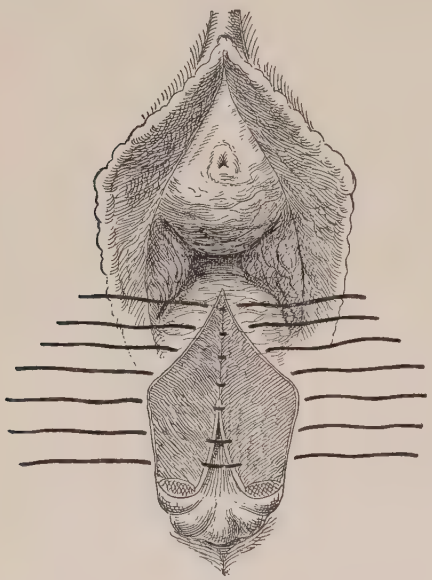


FIG. 688.

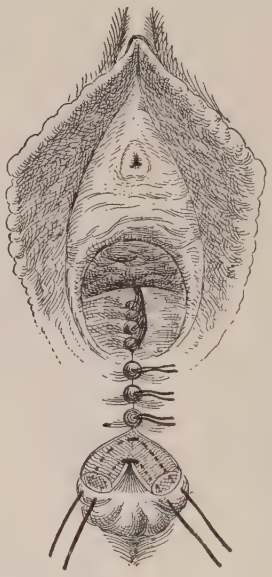


FIG. 689.

PRIMARY OPERATION FOR THE REPAIR OF A MEDIAN TEAR OF THE PELVIC FLOOR INVOLVING THE SPHINCTER ANI.

Fig. 688 shows the sutures introduced to close the rectovaginal septum; Fig. 689 shows the rectovaginal septum sutures shotted and the sutures introduced to unite the torn ends of the sphincter muscle.

rectal margin of the torn septum without penetrating the mucous lining of the bowel. The suture is then reintroduced in the same position on the other side of the septum and brought out through the vagina opposite to the point of original entrance. Similar sutures, one-fourth of an inch apart, are then passed downward to within one-third of an inch of the anal opening. The sutures are now shotted, beginning at the upper angle of the tear, and the operator then proceeds to approximate the torn edges of the sphincter ani muscle as follows:

The first suture is introduced under the inner margin of the torn end of the sphincter ani muscle and carried through the tissues at the edge of the rectal mucous membrane, emerging at the angle of the laceration just below the last suture closing the septum. It is then reintroduced and brought out upon the opposite side under the inner margin of the other end of the sphincter ani

muscle. The second suture is introduced under the outer margin of the muscle and passed in a similar manner to emerge upon the opposite side (Fig. 689). The sutures are then shotted, and if necessary one or two superficial stitches may be introduced to approximate the skin above the united sphincter muscle (Fig. 690).

In introducing the sutures that control the torn ends of the sphincter muscle the operator must be careful to pass the needle very close to the edge of the wound in order to prevent inversion of the skin, which would necessarily interfere with or prevent union from taking place.

The operation is completed by douching the parts with a solution of corrosive sublimate (1 to 2000), followed by normal salt solution or sterile water, and removing the vaginal tampon after cutting off the free ends of the sutures about half an inch beyond the shot (Fig. 690). A gauze compress is finally placed over the vulva and the patient put back in bed.

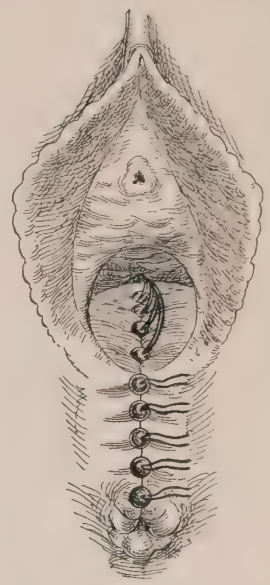


FIG. 690.—PRIMARY OPERATION FOR THE REPAIR OF A MEDIAN TEAR OF THE PELVIC FLOOR INVOLVING THE SPHINCTER ANI MUSCLE.

Shows the sutures uniting the torn ends of the muscles shotted and the operation completed.

Variations in the Technic.—If the tear does not involve the rectovaginal septum the superficial median tear in the perineum is first closed as already described, and then the torn ends of the sphincter muscle are united. The sutures are introduced in the same manner as described in the repair of a laceration involving the rectovaginal septum.

A median tear that only involves the outer fibers of the sphincter ani muscle must be carefully sutured, otherwise partial incontinence will result and the patient will have no control over liquid feces or flatus. The torn fibers of the muscles are easily brought together when the sutures are introduced to approximate the lower angle of the wound by passing the needle well under the partially lacerated ends of the sphincter on each side.

After-treatment.—*Care of the Wound.*—It is unnecessary to keep the patient's knees tied, and she should be allowed to lie on her side or move about as after a normal confinement. The parts should be douched twice a day with a solution of corrosive sublimate (1 to 2000), followed by sterile water or normal salt solution, and the gauze compress changed as often as necessary. The stitches should be removed on the eighth to the tenth day.

Bowels.—The bowels must not be permitted to become constipated and straining at stool must be avoided. I am in the habit of moving them on the second day by giving a mild laxative followed by an injection of an ounce of glycerin into the rectum, using for the purpose a small hard-rubber syringe with a narrow nozzle about two inches long. The bowels are then kept opened daily by using the laxative either alone or in connection with the injection of glycerin.

Bladder.—The use of a catheter, as a rule, is not required.

Getting Out of Bed.—The patient should remain in bed two weeks, and after getting up she should avoid all forms of heavy exercise and sexual intercourse for at least two months.

Lateral Tears Involving the Vaginal Sulci.—The repair of these lacerations is conducted as follows:

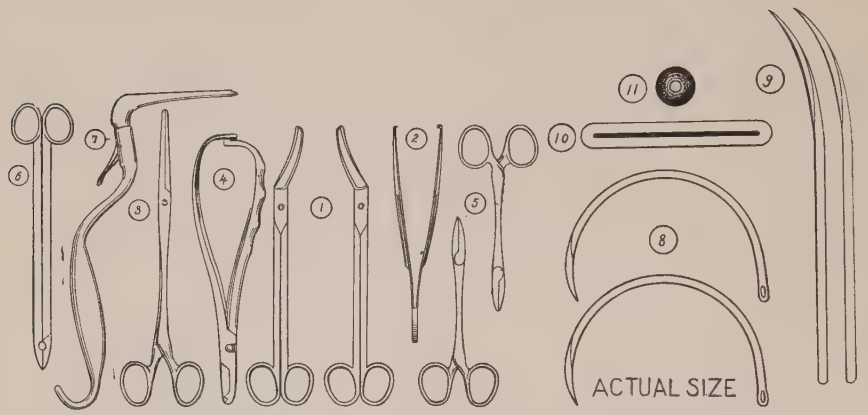


FIG. 691.—INSTRUMENTS, NEEDLES, SUTURE MATERIAL, AND PERFORATED SHOT USED IN THE PRIMARY OPERATION FOR THE REPAIR OF A MEDIAN TEAR OF THE PELVIC FLOOR INVOLVING THE VAGINAL SULCI.

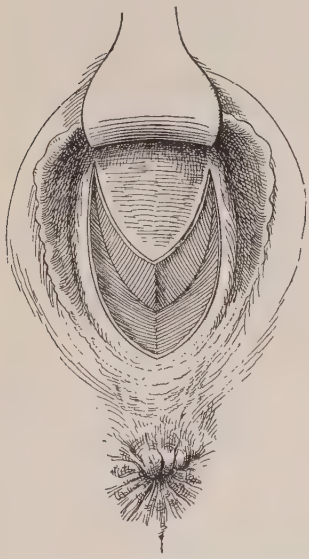


FIG. 692.

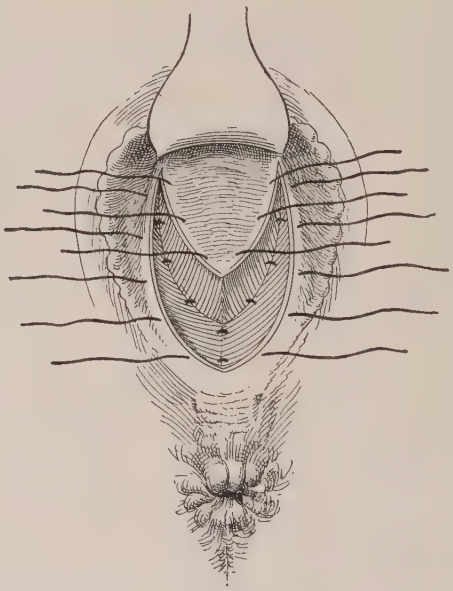


FIG. 693.

PRIMARY OPERATION FOR THE REPAIR OF LATERAL TEARS OF THE PELVIC FLOOR INVOLVING THE VAGINAL SULCI.

Fig. 692 shows the anterior vaginal wall elevated with Simon's speculum and the tears exposed; Fig. 693 shows the sutures introduced; note that Emmet's V-shaped sutures are used to close the sulci.

Sponges; Dressings; Solutions; etc.—The same as are used for the repair of a superficial median tear.

Instruments.—(1) Right and left Emmet's slightly curved scissors; (2) tissue forceps; (3) dressing forceps; (4) needle-holder; (5) two short hem-

ostatic forceps; (6) short compressor; (7) Simon's speculum (flat blade); (8) two small full-curved Hagedorn needles; (9) two perineal needles (Emmet's); (10) silkworm-gut—20 strands; (11) perforated shot (Fig. 691).

Assistants.—An anesthetizer (if necessary) and two assistants.

Technic.—After placing the patient in the proper position the assistants separate the labia and expose the posterior wall of the vagina, the vulvar canal, and the perineum.

The operator now douches the parts with a corrosive sublimate solution (1 to 2000) and *packs the upper part of the vagina with a gauze pad to keep back the discharges.* The anterior vaginal wall is then elevated by Simon's speculum and all ragged or uneven edges trimmed away from the margin of the wound with scissors (Fig. 692).

The lacerations in the sulci are now closed separately by a series of interrupted sutures beginning at the upper angle of each wound and continued downward until the edge of the superficial tear at the posterior margin of the vaginal outlet is reached. The sutures are first introduced in the left sulcus and then in the right, and after both series have been passed they are shotted and the sutures introduced into the perineal wound.

The sutures closing the left sulcus are introduced through the vaginal mucous membrane about one-eighth of an inch from the outer margin of the wound and then carried outward and downward, emerging at the bottom of the tear below the level of the point of entrance in order to encircle and pull up the retracted muscular fibers. The needle is then reintroduced near the point of exit at the bottom of the wound and brought out again on the vaginal surface opposite to the original point of entrance. The sutures closing the right sulcus are passed in a similar manner, except that the point of entrance is at the inner margin of the wound and the exit at the outer edge close to the lateral vaginal wall (Fig. 693).

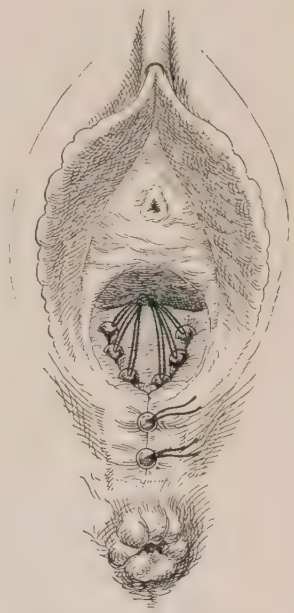


FIG. 694.—PRIMARY OPERATION FOR THE REPAIR OF TEARS OF THE PELVIC FLOOR INVOLVING THE VAGINAL SULCI.

Shows the sutures shotted and the operation completed. Note that the free ends of the internal sutures are placed up in the vagina.

The external wound in the perineum is closed in the same manner as described in the repair of a superficial median tear.

The operation is finally completed by removing the vaginal tampon and douching the parts with a solution of corrosive sublimate followed by sterile water or normal salt solution. A gauze compress secured by a T-bandage is placed over the vulva and the patient put back in bed.

After-treatment.—*Care of the Wound.*—The parts should be douched daily with a solution of corrosive sublimate (1 to 2000), followed by sterile water or normal salt solution, and the gauze compress changed as often as required. It is unnecessary to tie the knees, and the patient should be allowed to lie on her side as after a normal confinement. The external sutures are removed on the eighth day and the vaginal stitches are allowed to remain two weeks.

Bowels.—The care of the bowels is the same as in cases of median tears involving the sphincter ani muscle.

Bladder.—The use of the catheter is not required, as a rule, and the patient should be encouraged to void urine naturally.

Getting Out of Bed.—The patient should remain in bed two weeks, and after getting up she should avoid all heavy forms of exercise and sexual intercourse for at least two months.

Intermediate Operations.—An intermediate operation is performed at any time from twenty-four hours to two weeks after labor.

Indications.—The operation is indicated when the condition of the patient renders a primary repair unjustifiable or when the obstetrician has failed to recognize the lesion or has neglected to restore the parts immediately after labor.

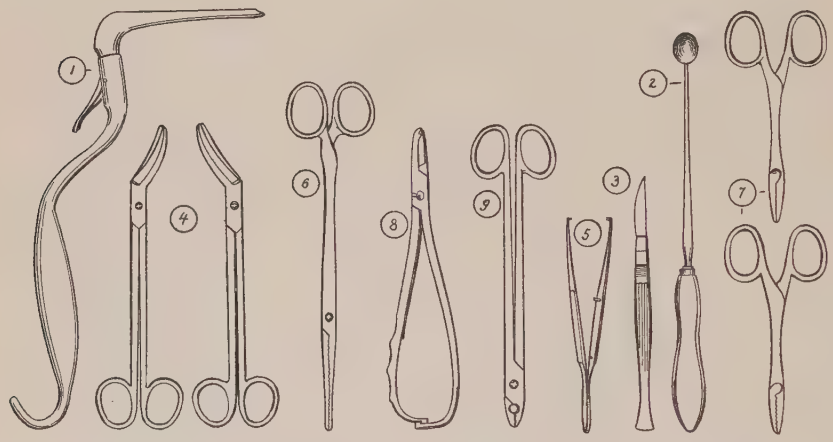


FIG. 695.—INSTRUMENTS USED IN THE INTERMEDIATE OPERATION FOR THE REPAIR OF LACERATIONS OF THE PELVIC FLOOR.

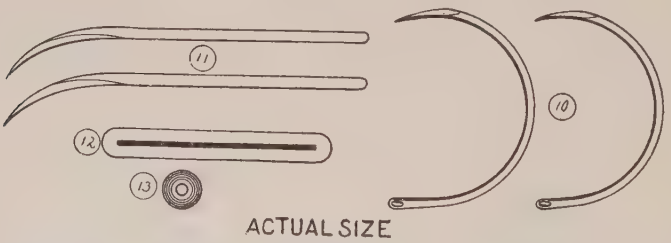


FIG. 696.—NEEDLES, SUTURE MATERIAL, AND PERFORATED SHOT USED IN THE INTERMEDIATE OPERATION FOR LACERATIONS OF THE PELVIC FLOOR.

Results.—The operation is not always successful, although good results frequently follow if the technic is thoroughly carried out.

Anesthesia.—While it is usually best to administer a general anesthetic, the operation can be readily performed under the local effect of cocain by injecting a few drops of a 4 per cent. solution around the edge of the wound and also applying it directly to the lacerated surface on a pledget of absorbent cotton. If the cocain is occasionally applied to the raw surfaces during the operation, the pain will be still further controlled and the patient rendered more comfortable.

Preparation of the Patient.—A bottle of citrate of magnesia should be given the night before, followed in the morning by an enema of soap-

suds and warm water, and the bladder should be emptied spontaneously just before the operation.

Position of the Patient.—The patient should be placed on a kitchen table in the dorsal position with a surgical pad under her hips (see p. 20).

Sponges; Dressings; Solutions; etc.—The same as are used in a primary operation for the repair of the three different varieties of tears.

Instruments.—(1) Simon's speculum (flat blade); (2) sharp spoon curet; (3) scalpel; (4) right and left Emmet's slightly curved scissors; (5) tissue forceps; (6) dressing forceps; (7) two short hemostatic forceps; (8) needle-holder; (9) shot compressors; (10) two small full-curved Hagedorn needles; (11) two perineal needles (Emmet's); (12) silkworm-gut -20 strands; (13) perforated shot.

Assistants.—The same number as are used in a primary operation for the repair of the three different varieties of tears.

Technic.—After placing the patient on the operating table the assistants separate the labia and expose the seat of injury. The operator then douches the parts with a corrosive sublimate solution (1 to 2000) and *tampons the upper vagina to keep back the discharges.*

The granulating surfaces are then carefully inspected and the situation and character of the tear ascertained. The granulation tissue is now scraped away with a curet or the knife and the ragged or uneven edges trimmed with scissors.

The wound is now converted into a recent injury, and therefore the introduction of the sutures and the subsequent technic, as well as the after-treatment, are the same as described in the primary operations for *superficial median tears, median tears involving the sphincter ani,* or *lateral tears involving the vaginal sulci,* as the case may be.

Secondary Operations.—A secondary operation is performed at any time after the wound has healed; it is good practice, however, to wait for at least eight weeks after labor in order to allow involution to take place.

Anesthesia.—A general anesthetic should always be employed.

Preparation of the Patient.—A bottle of citrate of magnesia should be given the night before, followed in the morning by an enema of soapsuds and warm water, and the bladder should be emptied spontaneously just prior to the administration of the anesthetic.

On the morning of the operation the patient should be given a full warm bath, thoroughly scrubbed with soap, and the hair on the lower part of the vulva clipped. After getting out of the bath the vagina and the vulva should be irrigated with a solution of corrosive sublimate (1 to 2000), followed by sterile water or normal salt solution, and the gluteal cleft, the anal region, the perineum, the external organs, and the inner surfaces of the thighs carefully sterilized as follows: Scrub the parts with a gauze sponge dipped in liquid soap and water and then douche with the corrosive sublimate solution, which in turn is removed with sterile water or normal salt solution. A large gauze compress secured by a T-bandage is then placed over the vulva, and the legs and thighs protected with Canton flannel stockings. The hips and lower extremities are finally wrapped in a sterile sheet, which is secured in front by safety-pins.

In tears involving the sphincter ani muscle mechanic sterilization should be relied on exclusively, as there is more or less danger of serious poisoning occurring from absorption by the bowel when a chemic agent is used.

Preparations for the Operation.—See page 831.

Instruments.—(1) Emmet's right and left full and slightly curved scissors; (2) four bullet forceps; (3) tissue forceps; (4) dressing forceps; (5) two short hemostatic forceps; (6) needle-holder; (7) shot compressor; (8) two

small full-curved Hagedorn needles; (9) two perineal needles (Emmet's); (10) silkworm-gut—20 strands; (11) perforated shot.

Number of Assistants.—An anesthetizer, two assistants, and a general nurse.

Position of the Patient.—Dorsal posture.

Final Sterilization of the Patient.—After the patient is thoroughly under the influence of the anesthetic she is placed on the operating table and the nurse then removes the sheet and the vulvar compress. The operator now pours two drachms of liquid soap into the vagina, and with a gauze sponge saturated with warm water and held in the grasp of dressing forceps

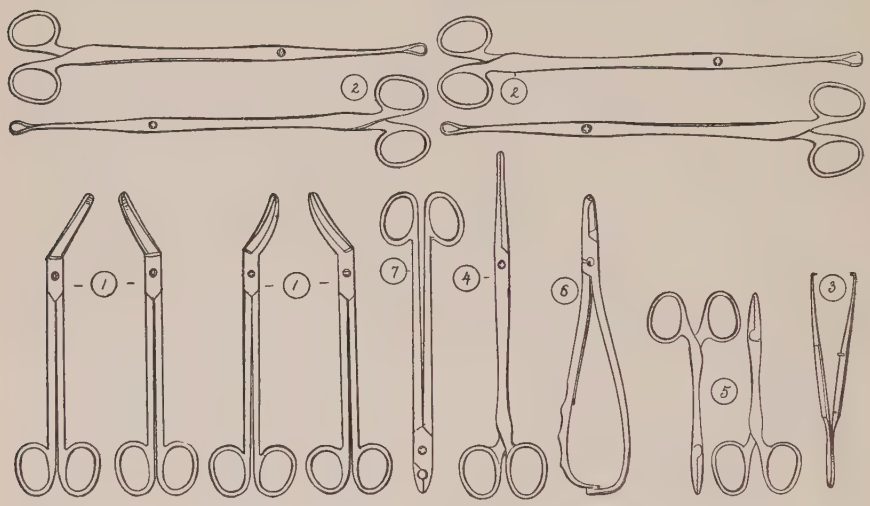


Fig. 697.—Instruments Used in Secondary Operations for the Repair of Lacerations of the Pelvic Floor.

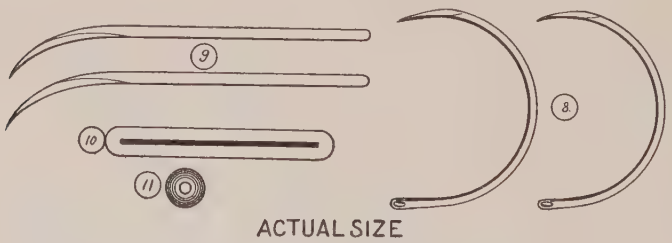


Fig. 698.—Needles, Suture Material, and Perforated Shot Used in Secondary Operations for the Repair of Lacerations of the Pelvic Floor.

mechanically sterilizes the vaginal canal by vigorous scrubbing. The vagina is then douched with a solution of corrosive sublimate (1 to 2000), followed by sterile water or normal salt solution, and the vulvar canal, the perineum, and the anus thoroughly scrubbed with a gauze sponge dipped in liquid soap and water, after which the parts are again douched with the sublimate solution and sterile water or normal salt solution.

In tears involving the sphincter ani muscle chemic sterilization should not be employed, for the reason previously mentioned.

Denudation.—The object in denuding the site of the old laceration is

to remove the cicatricial tissue and expose the torn and separated underlying structures so that they can be united again and the integrity of the parts restored. We must, therefore, aim to reproduce as closely as possible the outlines of the original tear, without, however, encroaching upon or sacrificing normal tissue, bearing in mind, however, that more or less contraction has occurred and that the denudation must consequently be greater than the area of the scar surface. To accomplish this, a careful inspection must first be made of the situation and extent of the scar tissue, and then before starting the denudation certain points on the outlines of the old tear are caught with bullet forceps and held taut so that the intervening spaces can be easily denuded with the scissors. The location of these points will be noted later on in discussing the operative technic of the different varieties of perineal tears.

Sutures.—I use silkworm-gut sutures exclusively in my practice in the repair of all injuries of the pelvic floor, and secure them with perforated shot. The necessary amount of traction to make upon the sutures in bringing the edges of the wound together requires considerable experience, and I believe there is less danger of causing too much or too little tension by fastening them with shot than by tying a surgical knot.

After closing the wound the free ends of the external sutures are cut off about one-half of an inch beyond the shot, and the internal sutures are gathered together and tied in a bunch; the short ends projecting beyond the knot are then cut off. The internal sutures are finally pushed up in the vagina out of the way, where they remain until subsequently removed. The removal of the vaginal sutures is greatly facilitated by leaving their ends long and tying them together, as the shot can be easily elevated and the scissors passed beneath them by making slight traction upon the knot. In operations involving the vaginal sulci the sutures in each sulcus are tied together separately.

In introducing the sutures the needle should not be passed too far away from the edge of the wound, as inversion of the skin or mucous membrane is liable to occur when they are shotted and interfere with the union. Again, the needle should not be passed parallel with the raw surface of the wound, but should be carried well outward so as to include a thick wedge of tissue and then made to emerge at the bottom of the tear, whence it is reintroduced and passed out on the opposite side in a similar manner.

Final Steps of the Operation.—The operation is finally completed by douching the vagina and the external organs with a corrosive sublimate solution (1 to 2000), followed by sterile water, and then drying the vaginal canal with a gauze sponge held by dressing forceps. The ends of the internal sutures are then pushed up in the vagina and a compress secured by a T-bandage is placed over the vulva.

After-treatment.—*Care of the Wound.*—The vagina and the external organs should be douched daily with a solution of corrosive sublimate (1 to 2000), followed by normal salt solution or sterile water, and the vulvar compress changed as often as required. It is unnecessary to tie the knees together, and the patient should be allowed to move about in bed and change her position after the first day.

Removal of the Sutures.—The sutures are removed in superficial median tears on the eighth day; in lacerations involving the sphincter ani muscle, on the eighth to the tenth day; and in injuries involving the vaginal sulci the external stitches are removed on the eighth day and the internal sutures at the end of two weeks.

Bowels.—The bowels should be moved daily after operations for the repair of superficial median tears.

In cases involving the sphincter ani muscle or the vaginal sulci a mild laxative,

followed by a rectal injection of an ounce of glycerin, is given on the second day. The bowels are then kept opened daily, and any tendency to constipation is avoided by using a laxative either alone or in connection with the glycerin injection.

Bladder.—The use of a catheter is not required, as a rule, and it is always advisable, if possible, to have the patient void her urine naturally.

Diet.—During the first two days liquid diet (see p. 106) should be given and then the patient should be placed on a convalescent diet (see p. 114).

Restlessness and Pain.—A hypodermic injection of morphin (gr. $\frac{1}{8}$) may be given during the first twenty-four hours if there is much pain or restlessness, and sleeplessness may be controlled with bromid of sodium, sulphonal, or trional.

Getting Out of Bed.—The patient should remain in bed two weeks, and

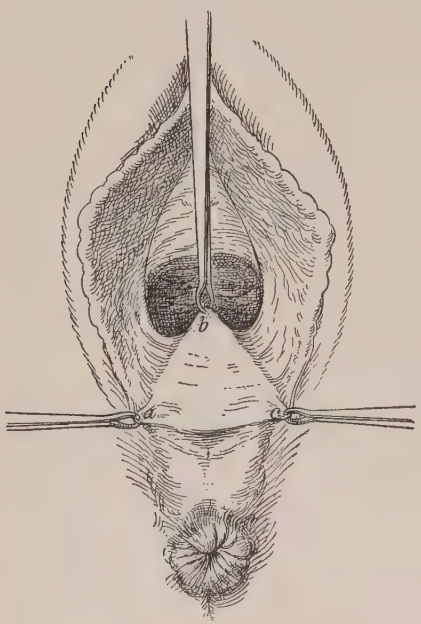


FIG. 699.

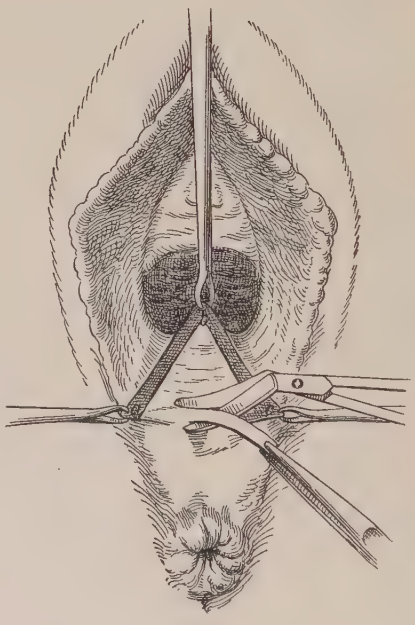


FIG. 700.

SECONDARY OPERATION FOR THE REPAIR OF A SUPERFICIAL MEDIAN TEAR OF THE PELVIC FLOOR.
Fig. 699 shows the three forceps in position at *a*, *b*, and *c*, and the intervening structures put upon the stretch; Fig. 700 shows the mucous membrane being denuded from *c* to *a*.

after getting up she should avoid all forms of heavy work or active exercise for at least two months.

Sexual Intercourse.—The sexual relations may be resumed in two months after the operation.

Superficial Median Tears.—A secondary operation is usually not required in these tears unless an irritable scar has formed on the perineum or in the vagina, as no important structures are involved and the integrity of the pelvic floor is unimpaired.

Operation.—Two points on opposite sides of the lower margin of the vaginal opening just in front of the orifices of the vulvovaginal glands (*a* and *c*) are caught with bullet forceps and the intervening tissues put slightly upon the stretch. The posterior wall of the vagina is then caught by bullet forceps in the

median line, about half an inch above the vaginal orifice (*b*); three forceps are now in position—one on each side of the vaginal orifice and one on the posterior wall of the vagina. By making slight traction upon these forceps in opposing directions a triangular space is formed (Fig. 699, *a*, *b*, *c*), which corresponds to the first area to be denuded.

The operator now seizes the mucous membrane at angle *c* with tissue forceps and denudes a strip of mucous membrane with scissors up to angle *b*. A similar strip is then denuded from angle *a* to *b*, and finally from angle *c* to *a*. A small strip of mucous membrane now remains in the center of the triangle, which is then removed and the upper denudation completed.

The lower or perineal end of the tear is then caught with bullet forceps at *d* and the three points, *a*, *c*, and *d*, made taut, thus forming an external triangular space which is denuded in a similar manner to the internal or vaginal triangle.

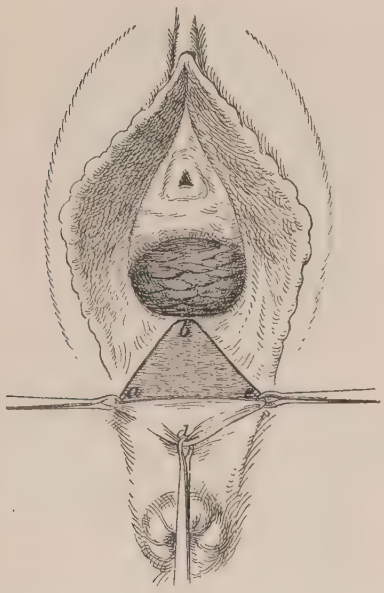


FIG. 701.

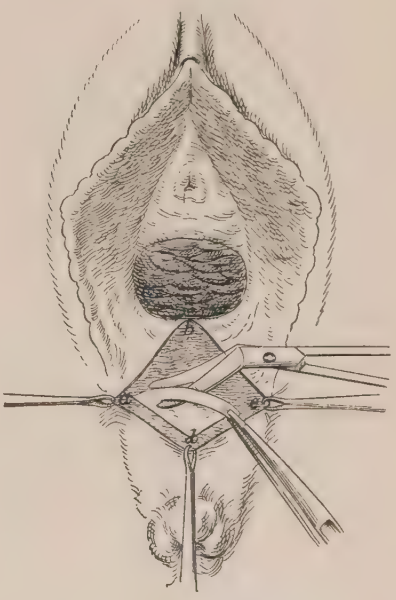


FIG. 702.

SECONDARY OPERATION FOR THE REPAIR OF A SUPERFICIAL MEDIAN TEAR OF THE PELVIC FLOOR.
Fig. 701 shows the upper or vaginal triangle (*a*, *b*, *c*) completely denuded; Fig. 702 shows the remaining strip of mucous membrane being removed from the lower or perineal triangle (*a*, *c*, *d*).

The wound is then closed as follows: The first suture should be passed near the upper or vaginal angle of the wound by introducing the needle about one-eighth of an inch from the edge of the denudation; it should then be carried outward so as to include a thick wedge of tissue and made to emerge at the bottom of the wound. It is then reintroduced near the point of exit and brought out through the mucous membrane opposite to the original point of entrance. Similar sutures are then placed about one-fourth of an inch apart down to the lower or perineal angle of the wound (Fig. 703).

The sutures are not shotted until they have all been introduced (Fig. 704).

Median Tears Involving the Sphincter Ani.—The repair of these lacerations is conducted as follows:

Operation.—The posterior vaginal wall just above the apex of the tear

and two points on the opposite side of the ruptured septum immediately above the separated ends of the sphincter ani muscle (*a*, *a*) are caught with bullet forceps (Fig. 705) and slight traction made in opposing directions. The operator now seizes the skin with tissue forceps and denudes with the scissors a broad surface on the edge of the left septal tear. The denudation must be wide enough to give a good approximation surface, and it should extend down to, but not beyond, the rectal mucous membrane. The edge of the tear on the opposite side of the septum is then denuded in a similar manner and the sutures introduced as follows:

The first septal suture is passed through the vaginal mucous membrane at the apex of the tear about one-eighth of an inch from the edge of the wound and made to emerge at the rectal margin of the torn septum without penetrating the mucous lining of the bowel. The suture is then reintroduced at the same position on the

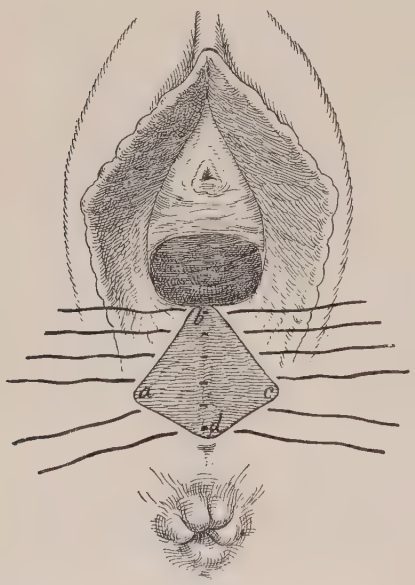


Fig. 703.

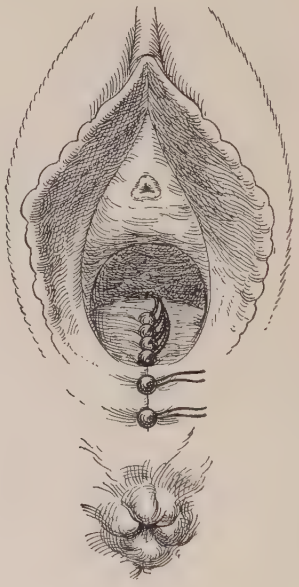


Fig. 704.

Secondary Operation for the Repair of a Superficial Median Tear of the Pelvic Floor (page 799). Fig. 703 shows the denudation completed and the sutures introduced; Fig. 704 shows the sutures shotted and the operation completed.

other side of the septum and brought out through the vagina opposite to the original point of entrance. Similar sutures are then passed downward to within one-third of an inch of the anal opening (Fig. 706). The sutures are now shotted, beginning at the upper angle of the tear, and the operator then proceeds to denude the cicatricial tissue around the anal opening and the skin covering the ends of the torn muscle (Fig. 707).

A point on the outer side of the position of each sphincter depression is caught with bullet forceps (Fig. 707) and the free end of the last septal suture is grasped with a hemostat. The three forceps are then held by the assistants, who make slight traction upon them and put the intervening tissues upon the stretch. The operator now picks up the skin overlying the left end of the sphincter with tissue forceps and cuts it away with full-curved scissors so as to completely expose

the torn fibers of the muscle (Fig. 707). He then denudes the cicatricial tissue from the left side of the anal opening, making a wide approximation surface down to, but not including, the rectal mucosa. The denudation over the right end of the muscle and the right margin of the anal opening is then made in a similar manner.

The first suture is introduced under the inner margin of the torn end of the sphincter and carried through the tissues at the edge of the rectal mucous membrane to emerge just below the last suture closing the septum. It is then reintroduced and brought out on the opposite side under the inner margin of the other end of the sphincter. The second suture is introduced under the outer margin of the sphincter and passed in a similar manner, to emerge upon the opposite side (Fig. 708).

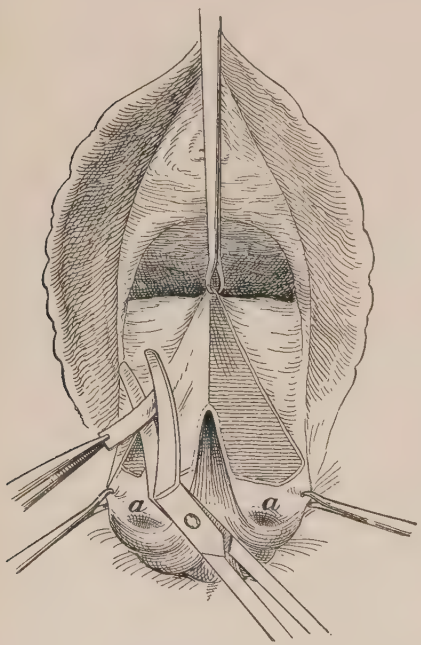


Fig. 705.

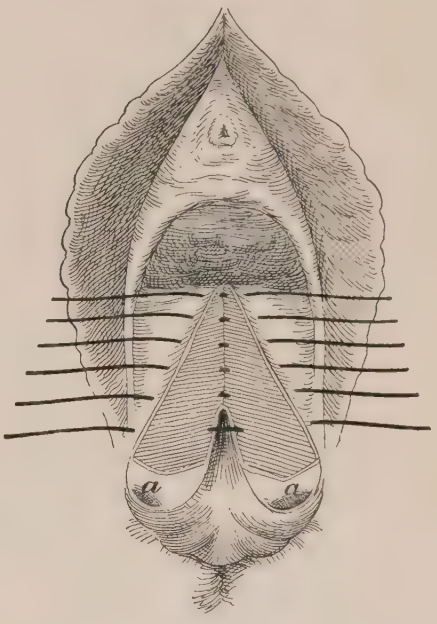


Fig. 706.

Secondary Operation for the Repair of a Median Tear of the Pelvic Floor Involving the Sphincter Ani Muscle.

Fig. 705 shows the left side of the rectovaginal septum denuded and the denudation being begun on the right side; Fig. 706 shows the sutures introduced to close the rectovaginal septum. *a*, *a*, in both illustrations mark the position of the sphincter depressions.

The sutures are then shotted, and if necessary one or two superficial stitches may be introduced to approximate the skin above the reunited sphincter muscle (Fig. 690).

In introducing the sutures that control the torn ends of the muscle the operator must be careful to pass the needle very close to the edge of the wound in order to prevent inversion of the skin, which would necessarily interfere with or prevent union from taking place. It is a good plan to seize the end of the muscle and pull it out while the sutures are being passed, as it is usually very much retracted and may escape being picked up by the needle (Fig. 709).

Variations in the Technic.—If the tear does not involve the rectovaginal septum, the superficial median tear is first operated upon as already described, and then the torn ends of the sphincter muscle and the anterior margin

of the anal opening are denuded and sutured in the same manner as in the repair of a laceration involving the septum.

When only the outer fibers of the sphincter ani are ruptured in a median tear, the denudation at the lower end of the injury must be made so as to thoroughly expose the partially separated muscle, and the sutures introduced well under the torn fibers on each side, just as in a complete laceration.

Lateral Tears Involving the Vaginal Sulci.—These lacerations are repaired by Emmet's operation as follows:

Operation.—The first step of the operation is to seize the crest of the rectocele with bullet forceps at a point nearest the vulvovaginal orifice which can

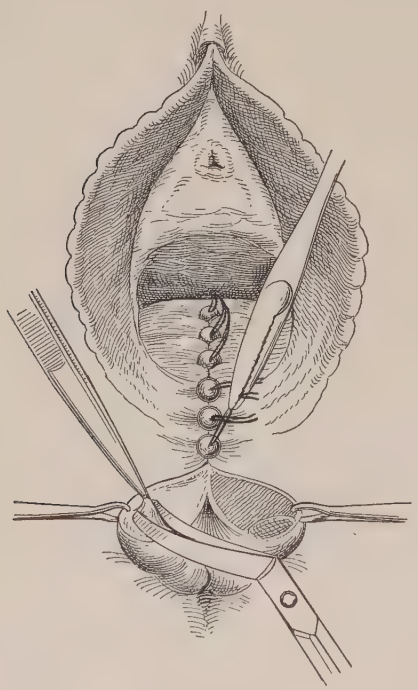


Fig. 707.

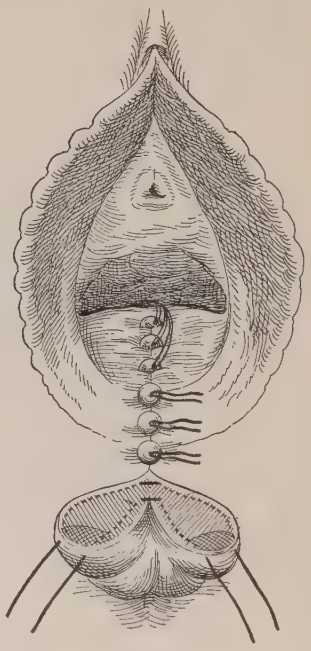


Fig. 708.

Secondary Operation for the Repair of a Median Tear of the Pelvic Floor Involving the Sphincter Ani Muscle (pages 800 and 801).

Fig. 707 shows the sutures closing the rectovaginal septum shotted and the denudation completed on the left side of the anal opening; on the right side the skin overlying the torn sphincter is picked up with forceps and being cut away with scissors; Fig. 708 shows the denudation completed on both sides of the anal opening and the sutures introduced uniting the torn ends of the sphincter ani muscle.

be drawn up without undue traction close to the external urinary meatus or laterally to the orifices of the vulvovaginal glands (Fig. 710).

Two points are then caught with forceps on opposite sides of the vaginal orifice which correspond to the position of the lowest caruncle or remains of the hymen. If we now bring the three forceps together and approximate the crest of the rectocele and the two points on the vaginal orifice, it will show exactly how the parts will be united and what the size of the new outlet will be when the sutures are introduced (Figs. 711 and 712).

The next step is to ascertain how far the torn levator ani muscle and the fascia on each side of the vagina have retracted toward the pelvic walls. This

is accomplished by making traction in opposite directions upon the two lateral forceps and drawing the crest of the rectocele well forward and toward the right side. When this has been done, a deep, gutter-shaped, triangular space will appear, running up the vagina for a distance of one or two inches at the side of the rectocele toward the cervix, which marks the limits of the retraction of the torn structures and indicates the area of the vaginal surface to be denuded (Fig. 713). The rectocele is then drawn toward the left side of the vaginal outlet and the opposite sulcus exposed (Fig. 714).

The two lower forceps attached to *b* and *c* are now pulled in opposite directions, the crest of the rectocele (*a*) drawn forward and toward the right side, and bullet forceps attached to the apex of the left triangle (*d*). The mucosa at *c*

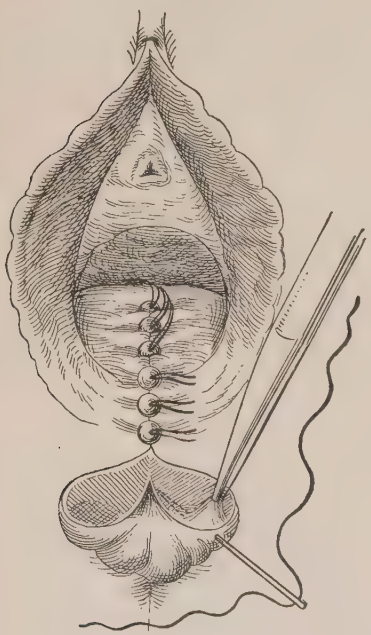


FIG. 709.—SECONDARY OPERATION FOR THE REPAIR OF A MEDIAN TEAR OF THE PELVIC FLOOR INVOLVING THE SPHINCTER ANI MUSCLE (page 801).

Showing the method of elevating the end of the sphincter muscle while the sutures are being passed beneath it.

FIG. 710.—EMMET'S OPERATION FOR THE SECONDARY REPAIR OF LATERAL TEARS OF THE PELVIC FLOOR INVOLVING THE VAGINAL SULCI.

Showing the method of determining the situation of the crest of the rectocele.

is then seized with tissue forceps and a strip of mucous membrane removed in a straight line as far as *d*. A similar strip is then removed between *a* and *d* and then a curved denudation with the concavity directed upward is made between *c* and *b* (Fig. 715). The rectocele is then drawn over toward the left side, bullet forceps attached to the apex of the right triangle (*e*) and the denudation continued first from *b* to *e* and then from *a* to *e*. The lines of denudation which are thus formed connect with each other and mark the area of the original laceration. The mucous membrane between these lines is then removed by cutting away contiguous strips with scissors until finally the entire area is denuded as shown in Fig. 716.

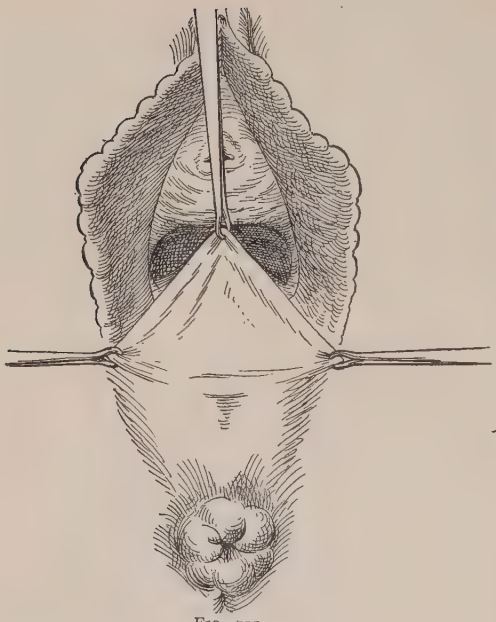


FIG. 711.

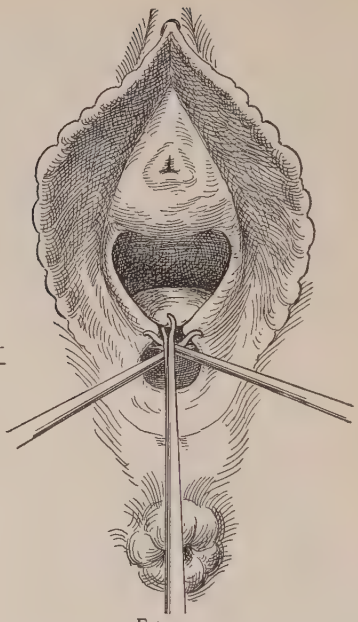


FIG. 712.

EMMET'S OPERATION FOR THE SECONDARY REPAIR OF LATERAL TEARS OF THE PELVIC FLOOR INVOLVING THE VAGINAL SULCI.

Fig. 711 shows forceps attached to the crest of the rectocele and on opposite sides of the vaginal orifice; Fig. 712 shows the method of determining what the size of the vulvovaginal orifice will be when the operation is completed.

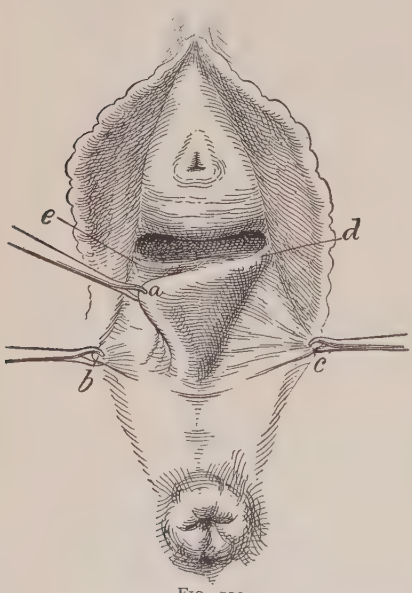


FIG. 713.

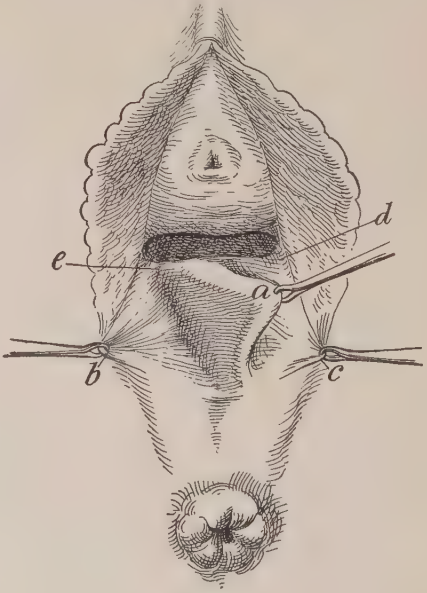


FIG. 714.

EMMET'S OPERATION FOR THE SECONDARY REPAIR OF LATERAL TEARS OF THE PELVIC FLOOR INVOLVING THE VAGINAL SULCI.

Fig. 713 shows the method of ascertaining the depth of the tear in the left sulcus; Fig. 714 shows the method of ascertaining the depth of the tear in the right sulcus.

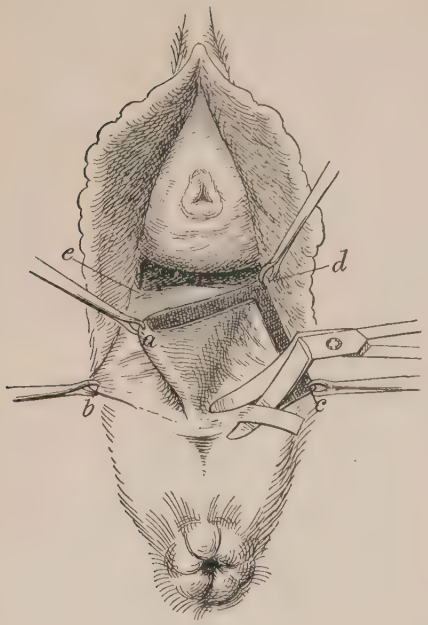


FIG. 715.

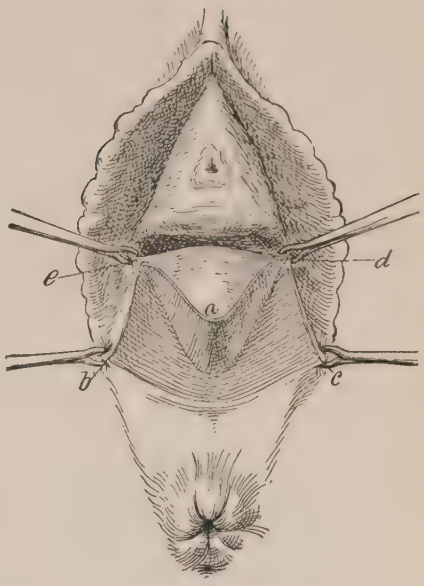


FIG. 716.

EMMET'S OPERATION FOR THE SECONDARY REPAIR OF LATERAL TEARS OF THE PELVIC FLOOR INVOLVING THE VAGINAL SULCI (page 803).

Fig. 715 shows the denudation made between *c*, *d*, and *a*, and a strip of skin being removed with scissors between *c* and *b*; Fig. 716 shows the denudation completed.

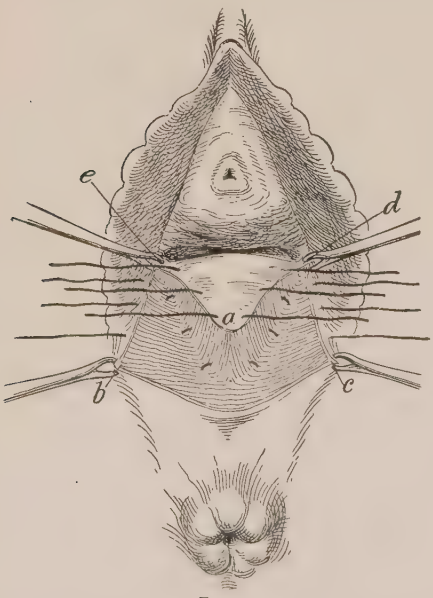


FIG. 717.

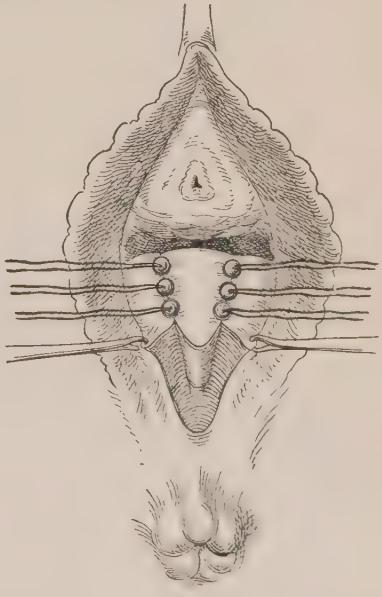


FIG. 718.

EMMET'S OPERATION FOR THE SECONDARY REPAIR OF LATERAL TEARS OF THE PELVIC FLOOR INVOLVING THE VAGINAL SULCI.

Fig. 717 shows the sutures introduced into both sulci; note that Emmet's V-shaped sutures are used; Fig. 718 shows the sutures shotted in both sulci.

The sutures are first introduced into the left sulcus and then into the right, and after both series have been passed they are shotted and the vulvar end of the denudation is united last (Figs. 717 and 718).

The left sulcus is closed as follows: The first suture is introduced at the upper angle of the wound (*d*) by passing the needle through the vaginal mucous membrane about one-eighth of an inch from the outer margin of the denudation and then carrying it outward and downward, emerging at the bottom of the tear below the level of its point of entrance. The needle is then reintroduced near the point of exit at the bottom of the wound and brought out again on the vaginal surface opposite to the original point of entrance (Fig. 717). This constitutes Emmet's V-shaped suture, which is an important factor in the technic, as it encircles and pulls up the retracted muscular fibers and fascia when the sulcus is

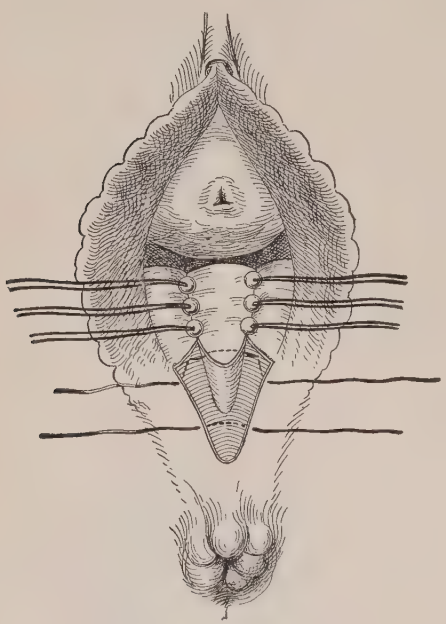


Fig. 719.

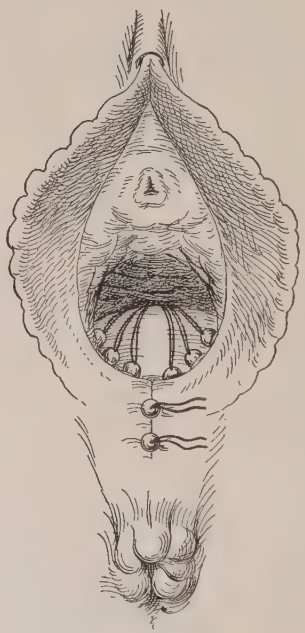


Fig. 720.

Emmet's Operation for the Repair of Lateral Tears of the Pelvic Floor Involving the Vaginal Sulci.

Fig. 719 shows the sutures introduced to close the vulvar end of the denudation; the upper suture is called the "crown stitch"; Fig. 720 shows the sutures shotted and the operation completed.

closed. Additional V-shaped sutures about one-fourth of an inch apart are then introduced down to the vulvar end of the denudation.

The sutures closing the right sulcus are then passed in a similar manner, beginning at the upper angle of the denudation (*e*), except that the point of entrance of the needle is at the inner margin of the wound and the final exit at the outer edge close to the lateral vaginal wall (Fig. 717).

After the sutures in both sulci have been shotted the supporting power of the pelvic floor is restored, and nothing now remains but the suturing of the vulvar end of the denudation. This is accomplished as follows: The first suture, which is called the *crown stitch*, is introduced by passing the needle through the skin of the perineum close to the wound at the lateral edge of the denudation and then

carrying it outward and upward to emerge within the denuded surface close to the edge of the mucous membrane immediately below the last suture in the sulcus. It is then carried across the upper margin of the vulvar denudation and reintroduced under the mucous membrane covering the crest of the rectocele (*a*), whence it emerges on the opposite side. It is then carried across the vulvar denudation on the right side, introduced under the lateral edge of the denuded surface, and brought out opposite to the original point of entrance. A second suture is now introduced below the crown stitch to complete the closure of the cutaneous surface and the operation completed by shotting both sutures.

CHAPTER XXXIX.

ANTISEPSIS IN HOSPITALS.

It is my purpose to describe in this chapter the antiseptic technic which I employ in my own practice, as I believe that the student will gain a clearer conception of the subject by first studying the methods of an individual operator than he would by reviewing those of a number of surgeons.

Asepsis.—By this term is meant the absence of septic organisms.

Antisepsis.—By this term is meant the methods which are employed to remove, inhibit, or destroy septic organisms.

METHODS OF STERILIZATION.

The following antiseptic methods are employed to produce asepsis:

1. High-pressure steam.
2. Boiling aqueous solution of carbonate of soda.
3. Mechanic sterilization.
4. Chemic sterilization.

HIGH-PRESSURE STEAM.

Value.—Steam under high pressure is a certain and rapid method of sterilization and will absolutely destroy all bacteria with their spores.

Time Required for Sterilization.—From tests made by the author with a self-registering thermometer it was found that perfect sterilization is obtained in twenty minutes under a constant pressure of 15 pounds of steam, which gives a uniform temperature of 250° F.

Apparatus.—Two sterilizers are required—one for dressings, etc., and the other for water; they are heated by gas or by steam directly from the power plant of the hospital. It is impossible to understand the mechanism of these sterilizers without a practical demonstration of the action of the different valves and connections, and consequently it would be useless to attempt such a description. A practical knowledge, however, is very quickly acquired, and even a pupil nurse should have no difficulty whatever in taking charge of the sterilizers.

Sterilizer for Dressings.—The apparatus consists of a large cylinder in which the articles to be sterilized are placed, and is supplied with the necessary attachments and valves to evolve the steam and keep it under a constant definite pressure (Fig. 721).

The sterilizer is furnished with wire cages and conveyance boxes, in which the articles to be sterilized are placed. The construction of the wire cage is clearly shown by the illustration, and therefore needs no further description.

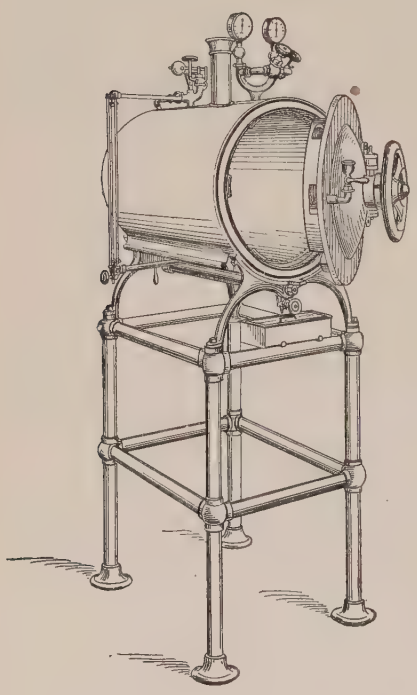


FIG. 721.—HIGH-PRESSURE STEAM STERILIZER FOR DRESSINGS (page 807).

The boxes are manufactured by Richard Kny & Company, of New York, and are known as Ashton's rectangular telescopic boxes. They are 10 inches square by 6 inches deep, and consist of a heavy copper or brass nickel-plated box and cover. The bottom of the sides of the box is perforated by a number of small holes through which the steam circulates, and is surrounded by a flange one-half of an inch deep and one-fourth of an inch wide that forms a slot into which the lid fits. After filling the box with the materials for sterilization a strip of cotton batting is loosely packed in the slot and the lid slid down over the box as far as the small perforations, where it is held by pins on two sides which fit into holes made for the purpose. The box is then placed in the sterilizer, and after the sterilization is completed, the pins are withdrawn and the lid allowed to sink into the cotton batting which fills the slot. The contents of the box are thus protected from contamination so long as the cotton batting is not disturbed and the lid remains in place. The advantage of these boxes is that the dressings, etc., can be sterilized in them for successive operations and kept free from any possible chance of contamination

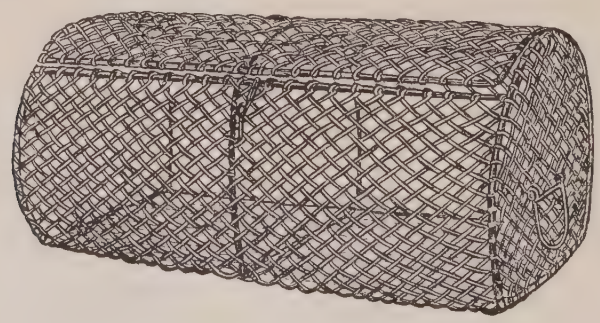


FIG. 722.—WIRE CAGE FOR HOLDING ARTICLES DURING STERILIZATION.

until they are used, which is not the case when ordinary open receptacles are employed. And, furthermore, these boxes can be conveyed any distance with-

out the slightest danger of their contents becoming infected, which is an important factor to consider when an operation is performed at a private house.

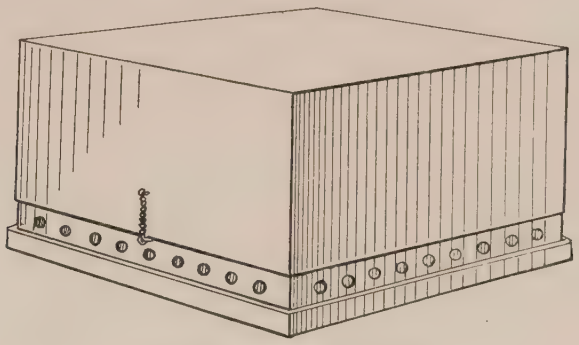


FIG. 723.—ASHTON'S CONVEYANCE BOX.

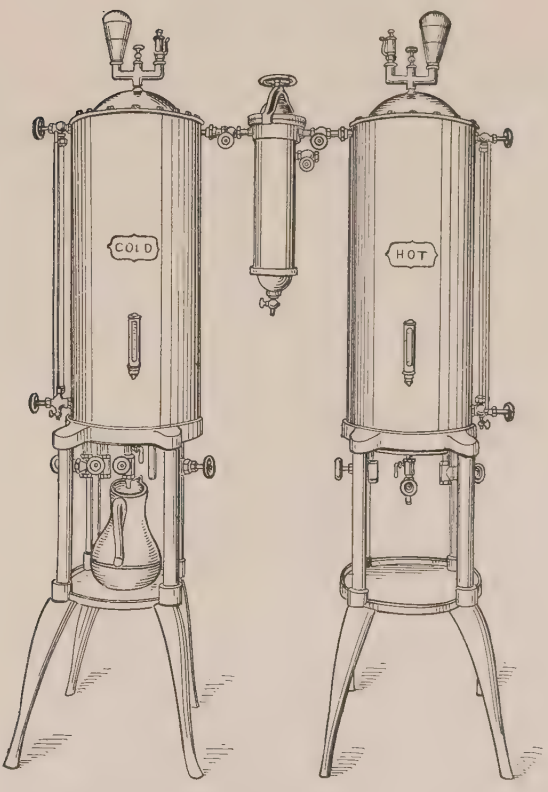


FIG. 724.—HOT AND COLD WATER HIGH-PRESSURE STEAM STERILIZERS (page 810).

In sterilizing by high-pressure steam the contents of the boxes and the wire cage must be packed or rolled loosely so that the steam can circulate freely through them and penetrate to the center of each parcel.

Water Sterilizers.—This apparatus consists of two cylindric reservoirs or tanks—one for cold and the other for hot water—and is supplied with the necessary mechanism to boil the water under high pressure. One of the tanks contains a secondary coil of pipe, through which cold water is allowed to circulate after sterilization in both reservoirs is completed, and thus in a short time the operating room can be supplied with both cold and hot water (Fig. 724).

BOILING AQUEOUS SOLUTION OF CARBONATE OF SODA.

Value.—A 1 per cent. solution of carbonate of soda is employed when boiling water is used as an antiseptic. The addition of the soda increases the germicidal action of boiling water and prevents metallic instruments from rusting.

Time Required for Sterilization.—Sterilization is completed in five minutes from the time the solution begins to boil.

Apparatus.—The apparatus which is shown is known as an *instrument*

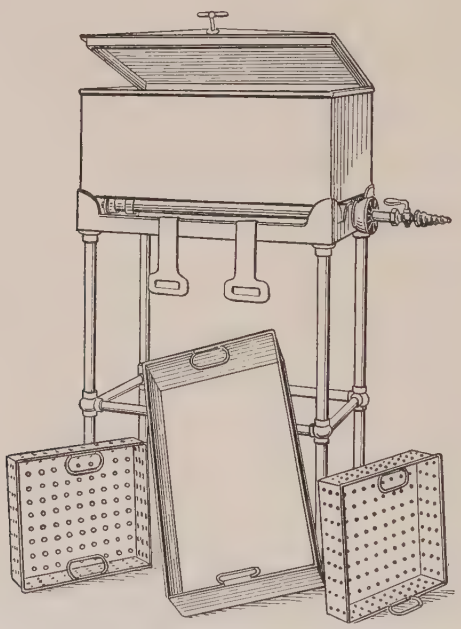


Fig. 725.—Instrument Sterilizer and Trays.

sterilizer; it is heated either by gas or steam, and set upon a table or permanently attached to a special stand.

The sterilizer is supplied with perforated metal trays in which the articles are placed and then immersed in the soda solution, and with a rectangular white steel porcelain-lined tray in which warm sterile water is placed to cover the instruments after they are sterilized.

MECHANIC STERILIZATION.

Definition.—This method consists in removing septic organisms by vigorous and continuous mechanic friction.

Value.—It is the best method we possess at the present time for sterilizing the hands and forearms as well as the field of operation.

Time Required for Sterilization.—The scrubbing should be continued for fifteen minutes.

Appliances.—Sterile brushes, water, and soap are required.

CHEMIC STERILIZATION.

Value.—The use of chemic agents in the technic of antisepsis has been almost entirely superseded by more certain and safer methods, and at the present time they are only employed in a very restricted way or in conjunction with other means.

High-pressure steam and a boiling soda solution are rapid and certain methods of sterilization, and they are employed exclusively, with positive results, to sterilize almost every article or appliance which is used at an operation. It is, therefore, not only useless but unmixed nonsense to consider the relative value of various chemic agents as compared with steam and boiling water. On the other hand, however, there are a few articles or appliances which are injured by steam or boiling water, and under these circumstances the use of chemic agents is indicated.

The value of chemic antiseptics in sterilizing the hands and the field of operation is a debatable question, and has not as yet been definitely settled. There is no doubt, however, of the fact that chemic disinfection alone is practically valueless, and that it must be preceded by thorough mechanic sterilization to accomplish any results. I have not used chemic agents for several years in the preparation of my hands or forearms because they injure the skin and cause it to become cracked and irritated. When the hands are in this condition, it is impossible to sterilize them mechanically, and consequently chemic agents often in the end do more harm than good. When chemic antiseptics are employed in sterilizing the field of operation, we do not need to consider their injurious effect upon the skin, as in the case of the hands, and I have therefore always taken advantage of any possible inhibitory or destructive property which they may possess, and have used them in conjunction with mechanic sterilization in preparing the parts for operation.

Indications.—Chemic agents are used in conjunction with mechanic sterilization in preparing the field of operation, and they are also employed to sterilize such articles, as hard-rubber syringes, catgut, special instruments, etc., that are injured by steam or boiling water.

Agents.—I employ the following chemicals: Bichlorid of mercury, formalin, formaldehyd gas, oil of juniper, alcohol, and cumol. The various uses of these agents are given in discussing the application of antisepsis.

THE APPLICATION OF ANTISEPSIS.

Instruments.—The instruments are placed in a perforated tray and boiled for five minutes in the soda solution. The tray is then removed from the sterilizer and placed in a receptacle containing a sufficient quantity of warm sterile water to cover the instruments.

After an operation the different parts of the instruments are separated and placed for five minutes in a tray containing cold water to dissolve the dried blood

which adheres to them. Hot water should not be used for this purpose, as it coagulates the albumen and makes it difficult to remove the blood. The instruments are then scrubbed with warm water and soap, and if they need polishing, a good sand-soap should be used. After they have been scrubbed they are rinsed in clear water and then boiled for one minute in the soda solution. They are then taken out of the sterilizer; rapidly dried; and, after the separated parts are joined together, placed again in the instrument case. Unless the instruments are first boiled and then dried while they are very hot it is almost impossible to dry them thoroughly, as the towel cannot reach the small joints and locks in which the moisture collects.

A rapid and very efficient method of drying instruments after they have been boiled in the soda solution is to immerse them for a minute in 95 per cent. alcohol and then spread them out on a towel. The alcohol quickly evaporates and leaves the instruments absolutely dry. I use this method exclusively for instruments having delicate mechanisms and for those having a canal which must be kept free, as, for example, the cannula used in intravenous injections and the needle employed in hypodermoclysis. After the alcohol has evaporated these instruments are placed in a glass tray and immersed in coal-oil.

Needles.—The needles are passed through several layers of a gauze pad and put in a small wire cage (Fig. 726). They are then placed in a perforated

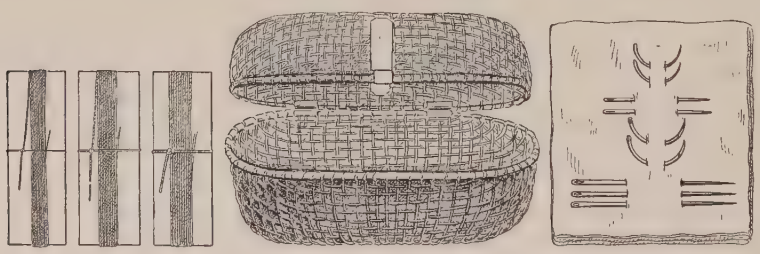


Fig. 726.—Shows Silk Ligatures Wound on Glass Slides, a Wire Cage, and Needles Passed through a Small Gauze Pad.

tray with the instruments and boiled in the soda solution. They are then taken out of the sterilizer and placed with the instruments in a receptacle containing warm sterile water.

After an operation they are cleaned in the same manner as the instruments.

Silk and Silkworm-gut.—The silk ligatures are wound on glass slides (Fig. 726) and placed in a small wire cage with the needles, and the silkworm-gut sutures are wrapped in a towel and secured with safety-pins. The cage and the towel are then placed in a perforated tray, put in the sterilizer, and boiled in the soda solution. After the sterilization is completed the tray is removed and placed in a receptacle containing warm sterile water.

Catgut.—The following method of preparing catgut is employed at the Gynecean Hospital of Philadelphia: Take the raw catgut and soak it in oil of juniper (wood) for one week and then in ether for forty-eight hours. Next put it in alcohol (95 per cent.) for forty-eight hours and then boil it in an alcohol bath for two hours. The catgut is then wound on glass spools and kept in the alcohol in which it was boiled. Before an operation two or three spools are taken out of the supply bottle and put in a small jar containing alcohol and boiled for fifteen minutes. The glass top should not be fastened down and the neck of the jar should be high enough out of the water to prevent it from boiling over into the

alcohol. If this happens, the alcohol becomes diluted with the water and the strength of the gut is destroyed.

In transferring the gut from one solution to another during the process of preparation and in winding it on glass spools the hands must be surgically aseptic and a pair of sterile rubber gloves worn. When the catgut is taken out of the supply jar, and also when it has been boiled for an operation, a pair of forceps must be used to prevent infecting it.

The alcohol is boiled by placing the glass jars in the instrument sterilizer and keeping the water boiling quietly.

I use a catgut prepared by Johnson & Johnson, which is sterilized by the cumol method and put up in germ-proof envelopes (see p. 825). The process of sterilization is complicated and not readily accomplished by the general practitioner.

Rubber Gloves.—The gloves are sterilized by high-pressure steam. They are then placed in a basin containing warm sterile water and covered with a towel. After an operation they should be thoroughly cleansed inside and out

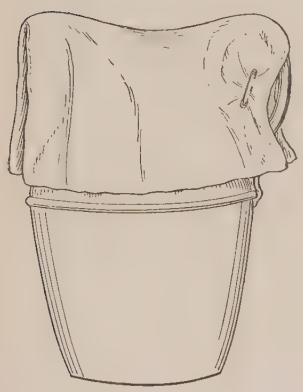


FIG. 727.—SHOWS A STERILE TOWEL PLACED OVER THE TOP OF A PITCHER AND SECURED WITH A SAFETY-PIN.

All the pitchers used at an operation are protected in this manner.

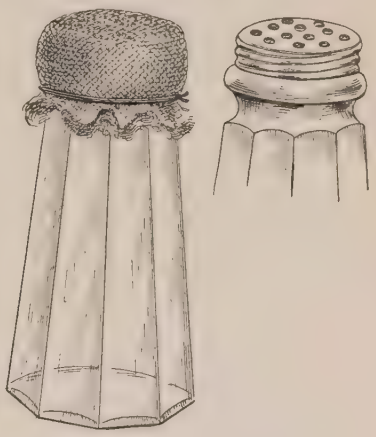


FIG. 728.—SPRINKLER-TOP BOTTLE PROTECTED BY CAP OF GAUZE (page 814).

The illustration on the right shows the perforations in the top of the bottle.

with warm water and soap and boiled for one minute in the soda solution. They are then dried, wrapped in a towel, and put away until needed. With ordinary care a pair of gloves should serve for several operations.

Hypodermic Syringe and Needle.—These articles are sterilized by boiling them in the soda solution. After an operation they are again boiled in the solution for one minute, then placed in alcohol, and finally immersed in coal-oil until ready for use.

Abdominal and General Irrigators.—These articles are sterilized by boiling them in the soda solution.

Pitchers; Basins; Surgical Pad.—These articles are first cleansed with soap and warm water and then sterilized by high-pressure steam. After an operation they are again cleansed with soap and water, carefully dried, and put away until needed.

Gauze Sponges, Pads, Compresses, and Tampons; Bandages; Towels; Sheets; Operating Gowns; Cotton Batting;

Absorbent Cotton; Safety-pins; Brushes.—These articles are sterilized by high-pressure steam. The brushes are cleansed in soap and warm water after being used and exposed to the air to dry before placing them again in the storage case.

Apparatus for Intravenous Saline Injections, Hypodermoclysis, and Enteroclysis.—These articles are sterilized by boiling them for ten minutes in plain water or by high-pressure steam.

Abdominal Dressing; Rubber and Glass Drainage-tubes; Glass Catheters.—These articles are sterilized by high-pressure steam.

Hot and Cold Water.—The water is drawn directly from the hot and cold sterilizing tanks into pitchers and protected from subsequent contamination by sterilized towels which are secured to the handles with safety-pins (Fig. 727).

Liquid Soap.—The soap is poured from the storage jar into the requisite number of sprinkler-top bottles, which are protected by a cap of gauze and sterilized by high-pressure steam as follows: The steam is turned into the heating coils of the sterilizer and the outlet valve left open until the contained air is expelled. When a large volume of steam escapes, the valve is shut off and the pressure allowed to reach fifteen pounds. At the end of five minutes the steam is turned off and the pressure allowed to gradually fall to zero by cooling (see sterilization of normal salt solution, p. 126). From tests made by the author, the pressure falls to zero in thirty-five minutes by the steam condensing, and the liquid soap is subjected to a temperature of 230° F. (Fig. 728).

Hard Soap.—The soap is taken out of the storage jar and rinsed in sterile water before using.

Drainage Syringe.—The syringe is sterilized with a 5 per cent. aqueous solution of formalin (40 per cent. aqueous solution of formaldehyd gas). The formalin is drawn into the barrel of the syringe and the entire instrument immersed in the solution for five minutes. The syringe is then thoroughly rinsed and placed in a pitcher containing sterile water.

PREPARATION OF THE OPERATOR AND HIS ASSISTANTS.

Personal Cleanliness.—The operator and his assistants must be scrupulously clean in their personal habits. They should take a general bath every day and wear clean underclothing and linen. The hair should be kept short and free from dandruff and the nails carefully manicured. Too little attention, as a rule, is paid to the care of the hands, and it is not an uncommon occurrence to meet surgeons who have long, irregularly trimmed, and dirty finger-nails. The nails are the most difficult parts of the hands to sterilize, and unless they are properly cared for, no amount of scrubbing will make them clean. They should be manicured twice a week as follows: *First*, file them very short with a thin, flexible file; *second*, soak the hands in warm water and soap for five minutes to soften the hard skin which grows under and around the nails; and, *third*, trim this skin carefully away with a sharp knife and smooth off the irregularities with the file.

The operator and his assistants should not make postmortem examinations, attend infectious diseases, handle pathologic specimens, or unnecessarily come in direct contact with any form of septic material.

Immediate Preparations.—The immediate personal preparations for an operation are made in the following order:

1. Remove all the clothing except the underclothes and the stockings.
2. Put on white canvas shoes with rubber soles, an operating suit, and a cap.
3. Sterilize the hands and forearms.
4. Put on rubber gloves and an operating gown.

Shoes, Suit, and Gauze-turban.—The canvas shoes are the same as those used in playing golf or lawn tennis and can be bought in any shop. They should be kept clean with soap and water and whitened with pipe-clay.

The operating suit consists of a white cotton shirt with short sleeves reaching only half-way down the arms and a pair of cotton duck or linen trousers. The suit can be bought at any shop where men's clothing is sold.

The turban is made by taking a yard of gauze and folding it on itself like a child's diaper. It is then placed on the surgeon's head and secured by tying the free ends.

The suit is laundered in the ordinary manner. The object of wearing the suit is to have clean and light clothing under the operating gown, which is sterile, and the cap prevents particles of dust or perspiration from falling from the head into the wound. The suit necessarily becomes more or less contaminated in putting it on and during the preparation of the hands and forearms, and it must not therefore be depended upon as an aseptic covering for the body.

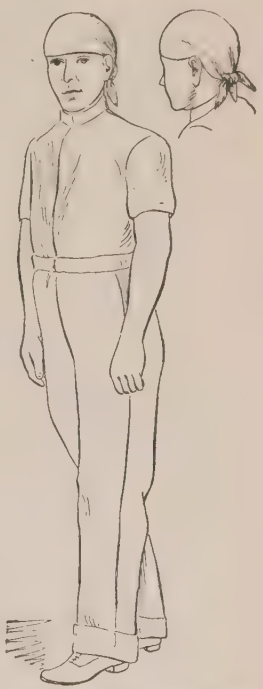


FIG. 729.—OPERATING SUIT, GAUZE-TURBAN, AND SHOES.

The dresses worn by the operating room nurses must be made of a material that can be washed, and they should be put on clean before the operation. The sleeves should be short and reach only half-way down the arms.

Sterilization of the Hands and Forearms.—This is accomplished by means of mechanic sterilization with brushes, hot water, and soap. The process is divided into two stages:

1. The preliminary cleansing to remove the ordinary contaminations which accumulate on the hands.

2. The final sterilization, which removes the septic bacteria from the cutaneous surface and the fingernails.

After the sterilization is completed the operator and his assistants should touch nothing but what is absolutely sterile, otherwise the hands will become reinfected and require another scrubbing.

PRELIMINARY CLEANSING. — The preliminary cleansing is made over the permanent wash-basin with running water from a spigot which is controlled, as described elsewhere, by foot-taps on the floor. The nails, hands, and forearms, as well as the elbows, are thoroughly scrubbed with a brush, hot water, and soap for five minutes. The soap is then washed off under the spigot and the second or final stage of the sterilization begun.

FINAL STERILIZATION. — The final sterilization is made in a portable basin, with a fresh brush, soap, and water. The scrubbing should be continued vigorously for ten minutes, changing the water twice during that time, and the soap should then be washed off by having the nurse pour cold sterile water from a pitcher upon the hands and forearms.

Separate brushes must be used for the preliminary and final sterilization, and under no circumstances

should a brush be used a second time without re-sterilizing it.

Fig. 730.—Method of Putting on Rubber Gloves. Note that the glove is distended with water.

Putting on the Rubber Gloves.—This is facilitated by partially filling each glove with cold sterile water from a pitcher before it is slipped on the hand.

Putting on the Operating Gown.—After putting on the gloves the surgeon takes his operating gown out of the box in which it was sterilized and slips his hands and arms through the sleeves. The general nurse then ties the tapes at the neck and the waist and thus secures the gown in position. The operator now takes the assistant's gown out of the box and holds it for him while he slips his hands and arms through the sleeves; the general nurse then secures the tapes.

The gowns are made of white muslin and cover the body from the neck to the feet. The sleeves are short and reach only half-way down the arms.

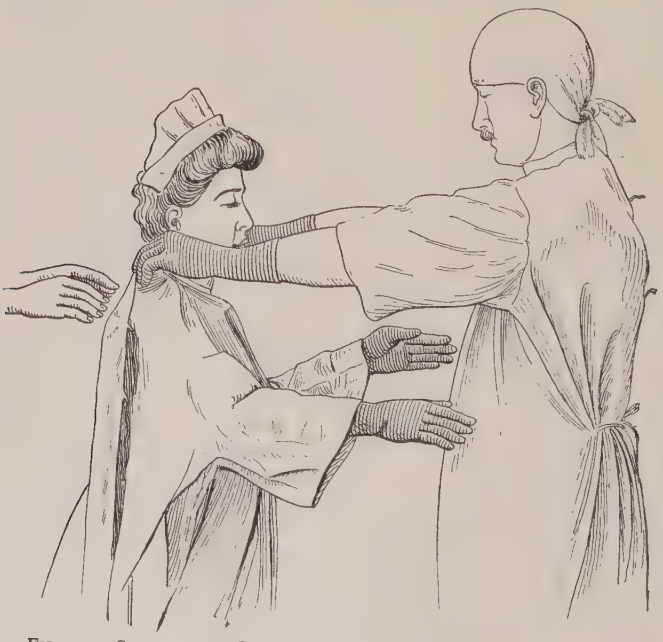


Fig. 731.—Showing the Operator Putting on the Assistant's Gown. Note the hands of the nurse ready to secure the tapes.

Fig. 732.—Front View.

Fig. 733.—Back View.

Operating Gown.

OPERATING ACCOMMODATIONS.

The surgical accommodations of a modern hospital should provide separate rooms for *operating*, *sterilizing*, *washing*, and *storage*. The necessity for this is self-evident when we consider the complex character of the technic of antisepsis and the imperative need of having everything as nearly scientifically correct as possible that has any connection whatever with an operation. If, for example, the same room is used for operating, sterilizing, washing, and storage, it certainly cannot be considered an ideal place in which to perform an operation, because the sterilizers will vitiate and overheat the air, the drains connected with the washstands may infect the atmosphere, and the presence of the instrument and dressing cases makes it practically impossible to properly mop and clean the walls and floor.

In considering the operating accommodations that are required for carrying out the technic of antisepsis I shall confine myself to a description of the rooms which are devoted to the gynecologic service at the Medico-Chirurgical Hospital of Philadelphia, and which form a part of the general clinical amphitheater building (Fig. 734).

OPERATING ROOM.

Description.—The room is about twenty feet square, wainscotted to the ceiling with Italian marble, and the floor covered with large slabs of gray Knoxville marble. There is a sloping skylight and a side-light opening to the north, which gives a well-diffused illumination for both abdominal and vaginal operations. The electric lighting is by single lights located in the ceiling, and there are also plug outlets situated in the wall to which bunch and single portable lights with reflectors are attached. The room is heated and ventilated by blowers

which supply tempered, warm, or cool air, and an exhaust system which takes away the vitiated air. The supply of air is brought from above the roof of the main building through a large shaft in which are placed perforated pipes out of which fine jets of water are thrown to wash the air as it descends into the air chamber below. From this chamber the air is drawn through a fine copper wire screen over which water is constantly flowing to moisten the air and wash it a second time. The air now passes over heated steam coils and thence into the blowers, from which it is driven into the operating room. To prevent the condensation and the consequent dripping or clouding of the skylights in cold weather coils of pipe through which steam circulates are placed under the ribs of the framework dividing the glass. These coils are attached close to the framework so as not to be conspicuous, and the steam is controlled by a separate valve.

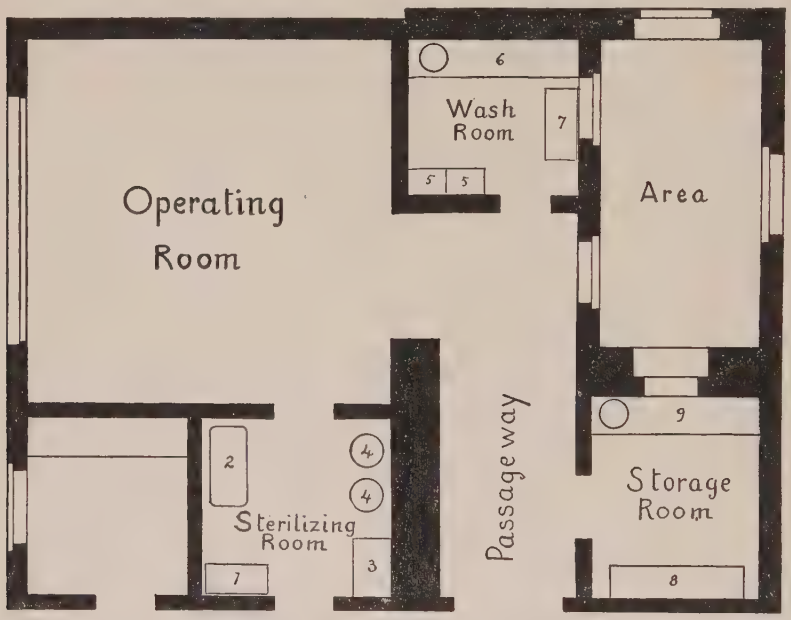


FIG. 734.—PLAN OF THE GYNECOLOGIC OPERATING ROOMS AT THE MEDICO-CHIRURGICAL HOSPITAL (page 817).
Sterilizing room: (1) Instrument sterilizer; (2) sterilizer for dressings; (3) marble slab; (4, 4) hot and cold water sterilizer. Wash room: (5, 5) Lockers; (6) wash-basin and marble slab; (7) supply table. Storage room: (8) Storage case; (9) wash-basin and marble slab.

The room is without permanent fixtures, such as washstands, drains, or tables, and hence it can be made practically sterile whenever required.

Equipment.—The room is equipped with (*a*) an operating table; (*b*) two stools; (*c*) an instrument table; (*d*) two washstands; (*e*) a supply table; and (*f*) two buckets.

Operating Table.—Boldt's operating table (Fig. 2), which is used, is made of white enameled metal with a glass top which can be raised to the Trendelenburg position and has adjustable leg-holders and stirrups. The glass top is so arranged that drainage is accomplished in abdominal operations without the use of a surgical pad, and the construction of the table is so simple that there is no difficulty whatever in keeping all the parts clean. The table can be employed in all abdominal and vaginal operations and also in making the various gynecologic examinations.

Stools.—The stools used by the operator and the anesthetizer are simple in construction and readily cleansed. They are made of white enameled metal and have revolving adjustable tops.

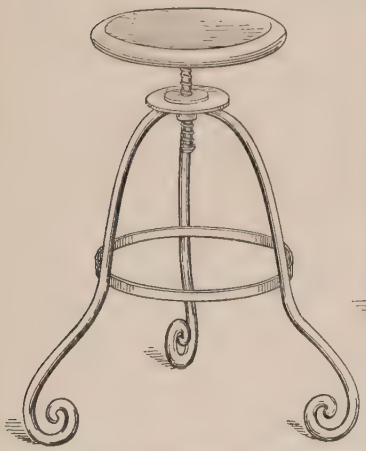


FIG. 735.—WHITE ENAMELED METAL STOOL.

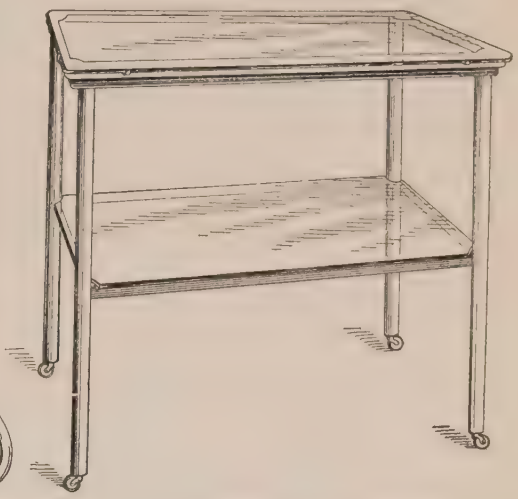


FIG. 736.—WHITE ENAMELED METAL INSTRUMENT TABLE WITH GLASS SHELVES.

FIG. 737.—WHITE ENAMELED METAL WASHSTAND WITH TWO BASINS (page 820).

Instrument Table.—The table is made of white enameled metal with a glass top and shelf, and measures 24 by 36 inches.

Washstands.—The washstands are made of white enameled metal and have adjustable basins. The stand used by the operator has two basins (Fig. 737) and that used by the assistant has one.

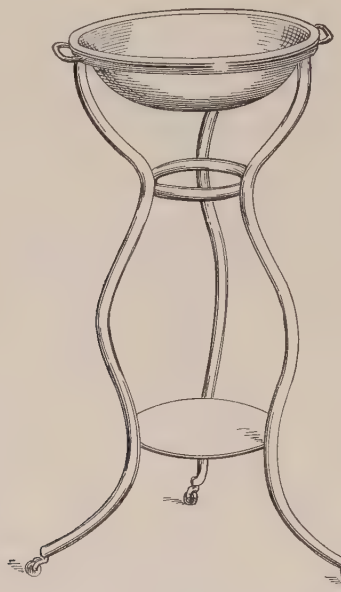


Fig. 738.—White Enameled Metal Washstand with One Basin.

Supply Table.—The table is forty inches long by twenty inches wide, and is made of white enameled metal with a glass top and two shelves.

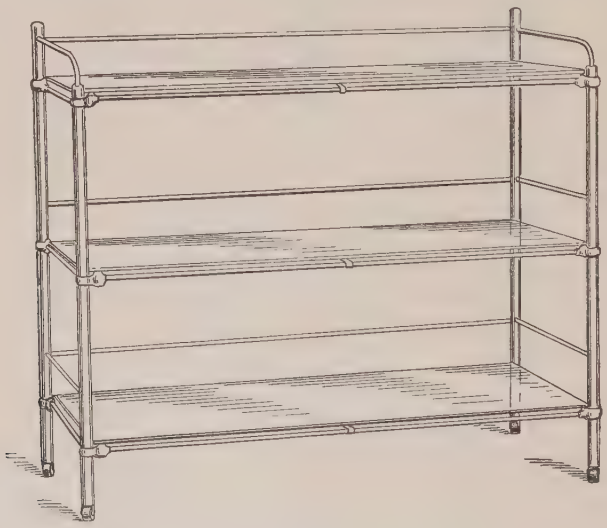


Fig. 739.—White Enameled Metal Supply Table with a Glass Top and Two Shelves.

Buckets.—The buckets are made of white enameled steel and have a capacity of four gallons each. They are used to collect the drainage from the perineal

pad during a vaginal operation and to hold soiled sponges and pads during an abdominal section.

Sterilization.—When we speak of sterilizing the operating room and its equipment, it must be distinctly understood that we do not use the word in the same sense as when applied to the sterilization of instruments, dressings, etc., because it is practically impossible to make the former aseptic; and unless this fact is fully appreciated, errors in technic are bound to occur which will be followed by septic infection. For example, we would not think for a moment of putting the hands, after they have been sterilized, against the walls of the most carefully prepared room, nor would we touch any of the equipment, because they are not and cannot be made sterile.

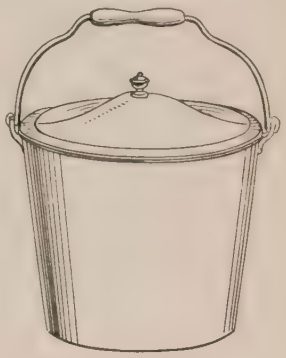


Fig. 740.—White Enameled Steel Bucket.

Practically there is no need for the room and the equipment to be sterile in a laboratory sense, because the hands of the operator and of his assistants, as well as the field of operation, do not come in direct contact with them. On the other hand, however, it is very necessary for them to be carefully washed and cleaned, not only after an operation, to remove the blood and the discharges that have accumulated, but also before an operation, to get rid of the dust and particles of septic matter which ordinarily settle everywhere in a room and infect the air when disturbed or set in motion.

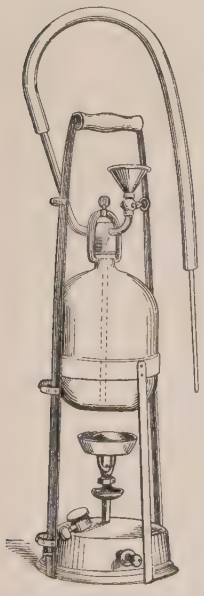


Fig. 741.—Lentz's Portable Formaldehyd Gas Disinfector.

The operating room and its equipment are cleaned in the following manner: Before an operation the ceiling, the walls, the windows and their frames, and the floor are thoroughly mopped or wiped with a wet cloth. The equipment, consisting of the operating table, the stools, the instrument table, the washstands, the general table, and the buckets, is scrubbed with warm water and soap and then rinsed with plain water and wiped dry.

After an operation the equipment is again cleaned in the same manner and the floor of the room thoroughly scrubbed with hot water and soap.

Several times each month the entire room should be scrubbed with hot water and soap and occasionally it should be disinfected with formaldehyd gas. This method of disinfection should be employed as a routine procedure after a septic operation. One of the best portable formaldehyd gas disinfectors on the market is made by Charles Lentz & Sons, of Philadelphia; it is simple in construction and very readily managed.

Temperature.—The temperature of the operating room is kept about 75° F. A low temperature must be avoided, as it is apt to cause shock from loss of heat, especially when the intestines are exposed during an abdominal section. On the other hand, a very high temperature is also injurious, as it produces excessive perspiration and exhausts the patient as well as the operator.

STERILIZING ROOM.

Description.—The room is about ten feet square, finished in marble, and lighted by a skylight and electricity. It adjoins the operating room and is separated from it by an opaque glass door.

Equipment.—The room is equipped with (*a*) an instrument sterilizer; (*b*) a high-pressure steam sterilizer; (*c*) a hot and cold water sterilizer; and (*d*) a marble shelf.

The sterilizers are described under Methods of Sterilization on page 807.

Marble Shelf.—The shelf is made of a slab of white marble 20 by 36 inches; it is placed 30 inches above the floor and is permanently fixed to the walls in a corner of the room. It is used to hold the trays and boxes before sterilization and for other similar purposes.

Care of the Room.—The walls, ceiling, and skylight are thoroughly mopped or wiped with a wet cloth every day, and once a week they are scrubbed with hot water and soap. The sterilizers are kept polished and free from the accumulation of dust and dirt.

WASH ROOM.

Description.—The wash room is ten feet square, finished in marble, and lighted by a side window, skylight, and electricity. It adjoins the operating room, but does not communicate with it directly, and it is heated and ventilated by the same system as the rest of the building.

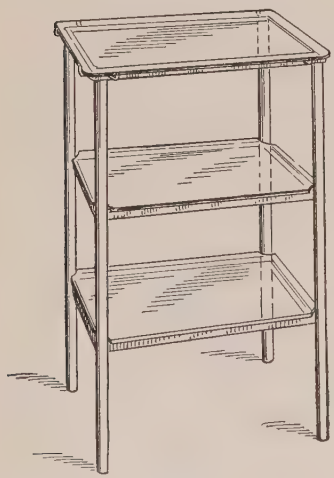


FIG. 742.—SUPPLY TABLE FOR THE WASH ROOM.

Equipment.—The room is equipped with (*a*) a washstand; (*b*) two lockers; and (*c*) a supply table.

Washstand.—The washstand occupies the whole length of one side of the room and consists of a long marble slab 18 inches wide by 10 feet long, in which are inserted two basins that are connected with drain pipes and hot and cold water mixing spigots. Foot taps are placed in the floor to control the flow and temperature of the water and to retain it in or release it from the basins. The unoccupied portion of the slab is used to hold portable basins and hot and cold water pitchers.

Lockers.—The lockers are used by the surgeon and his assistants for their ordinary clothes when they prepare for an operation, and also to store the operating suits, caps, and shoes.

Supply Table.—The table is fifteen inches wide and nineteen inches long, and is made of white enameled metal with a glass top and two glass shelves.

Care of the Room.—The interior of the room, including the lockers, is thoroughly mopped or wiped with a wet cloth every day and scrubbed once a week with hot water and soap.

STORAGE ROOM.

Description.—The room is ten feet square, wainscotted four and a half feet from the floor with Italian marble, and the walls and ceiling are covered

with a hard white enamel paint which is specially prepared to resist the action of soap and water.

Equipment.—The room is equipped with *(a)* a storage case and *(b)* a washstand.

Storage Case.—The case is made of hard wood and glass and is constructed with shelves and lockers in which are stored the entire operative paraphernalia.

Washstand.—The wash-stand occupies the whole length of the side of the room and consists of a slab of marble 18 inches wide by 12 feet long, in one end of which is inserted a basin that is connected with a drain-pipe and a cold and hot water mixing spigot which is controlled by foot taps. The other end of the slab is used as a table.

Care of the Room.—The interior of the room is thoroughly mopped or wiped with a wet cloth once or twice a week, and every month it is thoroughly scrubbed with hot water and soap. The floor and wash-stand are constantly cleaned with soap and water and the interior of the case and its contents are kept free from all gross forms of contamination.

OPERATING PARAPHERNALIA.

The operative paraphernalia is kept in the storage room and protected from gross forms of contamination, such as dust and particles of dirt.

The following list comprises the paraphernalia which is needed for minor and abdominal operations:

Instruments.—The instruments are classified and arranged on a shelf in the storage case.

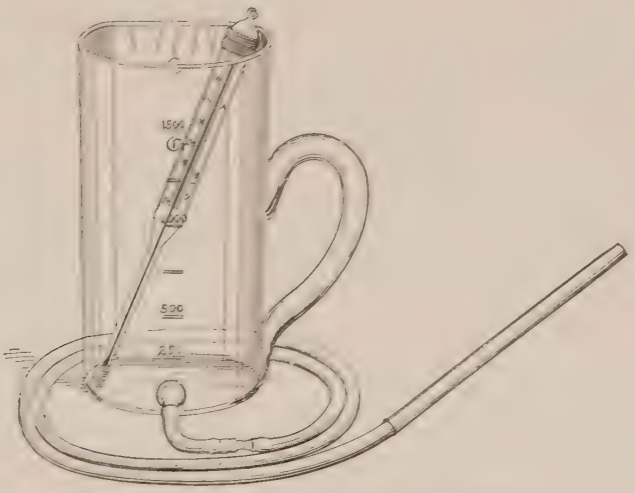


FIG. 743.—ASHTON'S ABDOMINAL IRRIGATING APPARATUS.

Needles.—The needles are inserted in a row along the middle of a strip of flannel which is folded and placed in a metal box.

Abdominal Irrigator.—This apparatus consists of a graduated glass reservoir, four feet of rubber tubing, a thermometer, and a metal tube.

General Irrigating Apparatus.—This consists of a graduated glass reservoir, four feet of rubber tubing, a thermometer, and glass tube (Fig. 744).

Rubber Drainage-tubes.—Rubber drainage tubing of different diameters and cut in lengths of ten inches is kept in a glass jar.

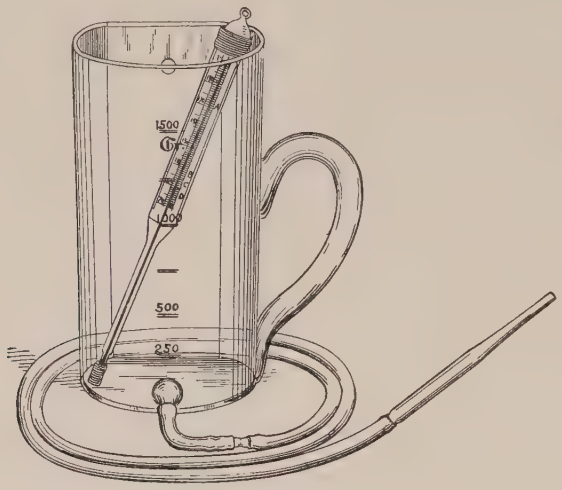


Fig. 744.—Ashton's General Irrigating Apparatus (page 823).

Glass Drainage-tubes.—Tubes of different diameters and lengths are kept in a glass jar. The best variety of tube is shown in Fig. 744. It has a flange at the proximal end, and the distal end, which is open, is perforated with a

Fig. 745.—Glass Drainage-tube.

number of small holes. The tubes should vary in length from 4 to 8 inches and in external diameter from $\frac{3}{8}$ to $\frac{1}{2}$ of an inch.

Drainage Syringe.—The syringe is made of hard rubber with a capacity

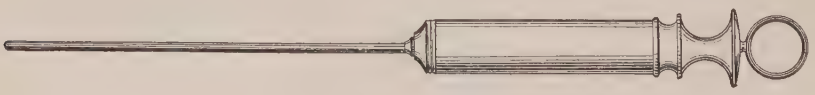


Fig. 746.—Hard-rubber Drainage Syringe.

of half an ounce and has a long narrow nozzle which will reach down to the bottom of a glass drainage-tube. A number of these syringes are kept on hand wrapped in a clean towel and put away in the case.

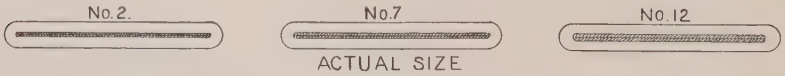


Fig. 747.—Different Sizes of Braided Silk Ligatures and Sutures.

Silk Ligatures and Sutures.—The silk is wound on glass spools and kept in a jar. I use braided silk exclusively, and employ three sizes: Nos. 2, 7, and 12.

Braided is preferable to twisted silk, as it is more readily manipulated than the latter, which has a decided tendency to kink and interfere with rapidity in operating. Figs. 748 and 749 show the difference in the pliability of the two silks. It is economy to buy one or two ounces at a time of each size of the silk.

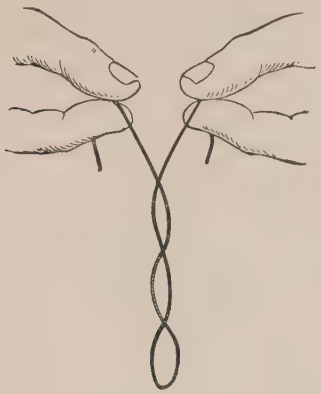


FIG. 748.—Twisted silk.

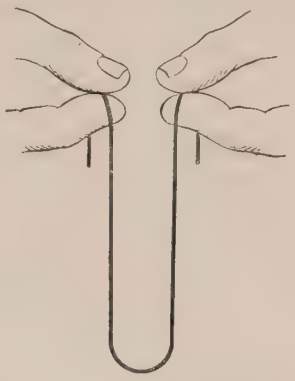


FIG. 749.—Braided silk.

SHOWS THE KINKING CHARACTER OF TWISTED SILK AND THE PLIABILITY OF BRAIDED SILK.

Silkworm-gut.—This material is bought in bundles of 100 strands each and kept in a glass jar. The strands should be from 13 to 15 inches long and of three different sizes—*fine, medium,* and *coarse.*

Catgut.—I have been using with satisfactory results the "Red Cross" catgut prepared by Johnson and Johnson. It is sterilized by the cumol method and put up in germ-proof envelopes. It comes in different sizes and is either plain or chromicized. I employ four sizes of each kind—Nos. 1, 2, 3, and 4. If the printed directions are carefully followed, there is no danger whatever of infecting the gut when it is removed from the envelope at the time of an operation.

FIG. 750.—DIFFERENT SIZES OF PLAIN AND CHROMICIZED CATGUT.

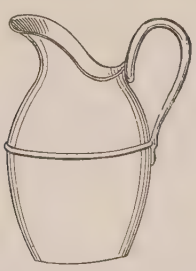


FIG. 751.—SEAMLESS WHITE ENAMELED STEEL PITCHER.

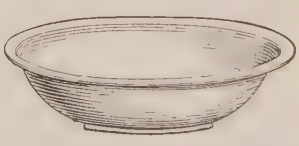


FIG. 752.—SEAMLESS WHITE ENAMELED STEEL BASIN.

If the surgeon desires to prepare his own catgut, the method that is described on page 812 may be employed.

Pitchers and Basins.—The pitchers and basins are seamless and made of white enameled steel. Seven pitchers and four basins, exclusive of those

belonging to the washstands in the operating room, are required for abdominal and minor operations.

Gauze Sponges.—The sponges are made by taking a piece of gauze 13 by 15 inches and tucking in its edges toward the center until a more or less rounded ball is formed. Eighteen dozen of these sponges are kept in a glass jar.

Gauze Pads.—My article on "Pads of Absorbent Gauze as a Substitute for Flat Sponges in Abdominal Surgery" appeared in the "Medical News," on February 20, 1892, and since that period marine sponges have practically been discarded by surgeons.

Fig. 753.—Gauze Sponge.

I employ two sizes: A large pad 9 inches square, and a small one $4\frac{1}{2}$ inches square. Each pad is composed of sixteen layers of gauze folded together in such a manner that the edges cannot fray. The large pad is made as follows: A single layer of gauze a yard square is folded at each end upon itself so that the folds meet in the middle. This makes two layers of gauze which are oblong in shape; the other ends are now folded over in the same manner. There are then four layers and the shape of the pad is square. It is again folded upon itself, making an oblong pad having eight layers. Folding it once more, the pad is then composed of sixteen layers and measures 9 inches square. To keep the pad in shape and the layers from becoming separated, the edges may be stitched together with ordinary white sewing cotton. The small pads are made in a similar manner by using a piece of gauze 18 inches square.

Three dozen large and small pads are kept in glass jars.

Gauze Compresses.—The compresses are made by taking a piece of

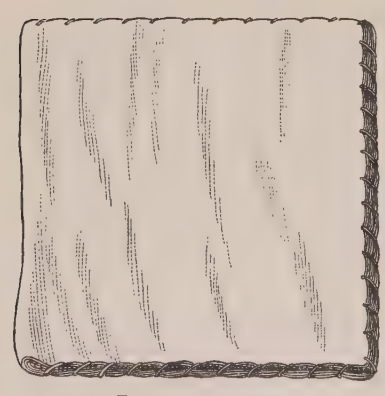


Fig. 754.—Edges stitched.

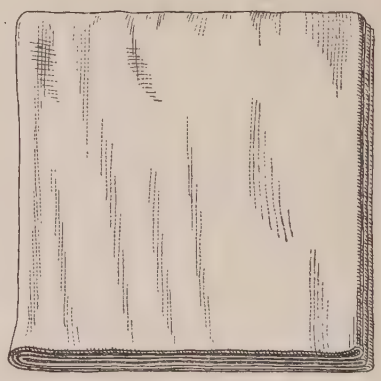


Fig. 755.—Edges free.

Ashton's Gauze Pads.

gauze 24 inches wide and 36 inches long and folding it so as to make two layers 12 by 36 inches. It is then folded three times in its long direction, making a compress of sixteen layers of gauze 12 by $4\frac{1}{2}$ inches. One dozen compresses are kept in a glass jar.

Gauze Tampons.—Each tampon consists of one yard of gauze folded so as to make a small loose roll which can be unfolded at the time of an operation and cut in any desired length or width. Two dozen tampons are kept in a glass jar.

Bandages.—The bandages are made of unbleached muslin and are used to keep dressings in place. The T-bandage which is employed to secure a vulvar compress is made by sewing a strip of muslin 4 inches wide by 32 inches long to the center of a similar strip 5 inches wide by 40 inches long. One dozen of these bandages are stored in a glass jar.

Abdominal Dressings.—The dressings used for the abdominal wound consist of two large gauze pads with a thick layer of absorbent cotton between them. Each set of dressings is wrapped in a clean towel and secured with

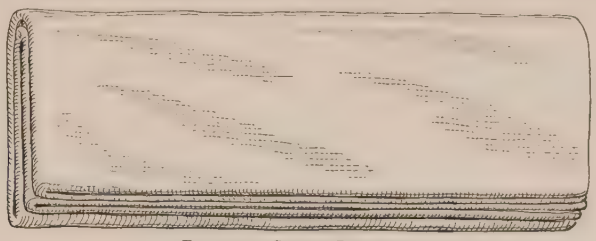


FIG. 756.—GAUZE COMPRESS.

safety-pins. A dozen sets of dressings are kept in a glass jar, from which they are taken when needed.

Adhesive Plaster.—Several rolls of zinc oxid adhesive plaster 2½ inches wide are kept in storage.

Rubber Gloves.—Several pairs of gloves are kept on hand wrapped in a clean towel and protected from the light, which has an injurious effect upon the rubber (Fig. 8).

Rubber gloves have become an important factor in the technic of modern

FIG. 757.—GAUZE TAMPON.

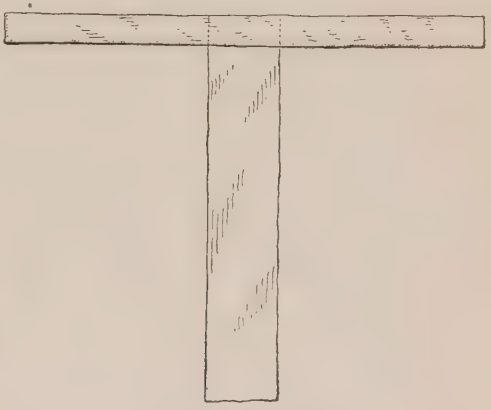


FIG. 758.—T-BANDAGE

surgery, and there is no doubt whatever of the fact that operative results have improved since they have come into general use. They do not dull the sense of touch to any great extent nor interfere seriously with rapidity in operating after the surgeon has become accustomed to their use, and it is only when dense pelvic adhesions are present that they impede somewhat the operation. Under these circumstances the tips of the fingers of the gloves slip and wrinkle badly when the adhesions are being separated, and it is sometimes impossible to enucleate a

mass that is firmly adherent. I have been obliged to remove my gloves in these cases a number of times and proceed with the operation without them. As a matter of fact, however, this necessity occurs less frequently at the present time than formerly, and I believe that eventually a surgeon can become so expert in the use of rubber gloves that they will very rarely interfere in any kind of operative work. One of the objections which has been made to the use of gloves is that operators are liable to become careless in the sterilization of their hands, and as the gloves may be cut or torn during an operation, infection may result. While this may possibly be true of a few surgeons who do not possess what Keen describes as "an aseptic conscience," I do not believe that such an objection should be seriously considered, as it cannot apply to the vast majority of operators.

Fig. 759.—Hand-brush made of Vegetable Fiber.

Towels, Sheets, Operating Gowns, Cotton Batting, Absorbent Cotton, and Safety-pins.—These articles are kept stored and properly protected from dust by wrapping them in clean sheets or towels.

Brushes.—A supply of hand-brushes is kept in a glass jar. I use large hand-brushes which have solid wooden backs and bristles made of vegetable fiber. They can be sterilized several times without injury; they are cheap; and the bristles are flexible and yet stiff enough for all practical purposes. The brushes which are used in a septic operation should be thrown away.

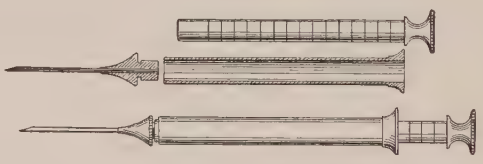


Fig. 760.—Hypodermic Syringe Made Entirely of Metal and Containing No Packing.

Liquid and Hard Soap.—These articles are kept in storage. I prefer a liquid soap (linimentum saponis mollis, U. S. P.), although a pure hard soap which has not been milled in the process of manufacturing answers all the requirements of an antiseptic technic, provided that it is well rinsed in sterile water before using. The hard soap is kept in a glass jar and the liquid soap is preserved

Fig. 761.—Glass Female Catheter.

in a large glass bottle, from which it is poured into sprinkler-top bottles when needed at the time of an operation. The method of making liquid soap is given on page 25.

Surgical Pads.—I use the Kelly surgical pad, which is made of pure rubber having a rim which is inflated to direct the water or drainage on to an apron which falls into a receptacle on the floor. The pad measures 14 inches in width and the apron is 22 inches long (see Fig. 15, p. 25).

Apparatus for Intravenous Saline Injections, Hypodermoclysis, and Enteroclysis; Normal Salt Solution.—A description of these articles is given under saline injections, on page 126.

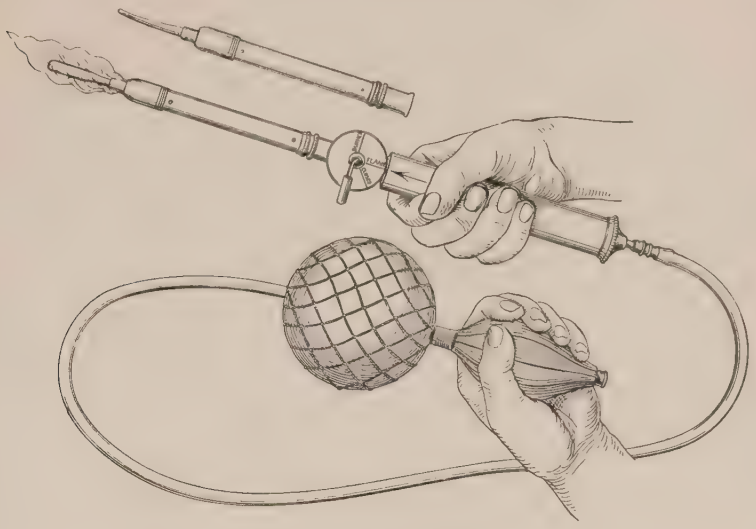


FIG. 762.—PAQUELIN'S CAUTERY.
Note that the benzene is contained in the handle of the apparatus.

Hypodermic Syringe.—The hypodermic syringe should be made entirely of metal and constructed to stand thermal methods of sterilization. There are a number of such syringes now sold in the shops, and any one of them will answer all the indications, provided there is no packing anywhere in the construction of the instrument.

Cardiac and Respiratory Stimulants.—Hypodermic tablets or solutions of the following drugs are kept on hand: Sulphate of strychnin, atropin, and nitroglycerin. Oxygen gas is kept in cylinders.

Local Remedies.—These include carbolic acid and tincture of iodin, which are kept in bottles with glass stoppers and poured into small medicine glasses when used at the time of an operation.

Glass Catheters.—The catheters are kept in a glass jar.

Paquelin's Cautery.—This apparatus must be kept in good working order and tested before every operation.

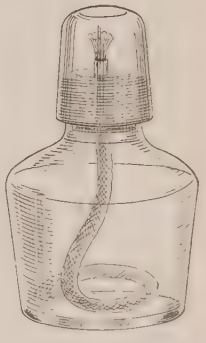


FIG. 763.—ALCOHOL LAMP.

Alcohol Lamp.—A small alcohol lamp made of glass is kept ready for use.

CHAPTER XL.

TECHNIC OF MINOR OPERATIONS.

PREPARATION OF THE PATIENT.

Examination of the General System.—A careful routine examination is made of the heart, the lungs, and the kidneys, and, if necessary, of other organs of the body, in order to determine the general condition of the patient. A serious organic lesion is a contraindication to any form of minor operation, especially when the disease is in an advanced stage and the general condition of the patient is bad. Sometimes, on the other hand, when the lesion is not serious, a few weeks' treatment will put the patient in a good condition and remove the operative dangers. It is most important to determine the state of the kidneys, as they are the chief excretory organs of the body, and they are called upon, as a rule, to perform extra work after an operation. An exact knowledge of the condition of these organs will not only indicate the proper preparatory and post-operative treatment to pursue, but it will also determine the selection of the anesthetic, and thus lessen the danger of subsequent uremic symptoms. Ether is contraindicated as an anesthetic when a renal lesion exists, and chloroform should therefore be administered. The lungs should also be carefully examined, especially for the presence of slight forms of bronchitis, which often develop into a pneumonia when ether is used as the anesthetic. If there is the slightest bronchial irritation discovered, chloroform should always be administered. A cardiac lesion is not, as a rule, a contraindication to an operation, but when the heart is diseased chloroform is a dangerous anesthetic and ether should always be employed.

Length of Preparation.—The patient is prepared in twenty-four hours unless the condition of the kidneys or some other organ makes a longer preparatory course of treatment necessary.

Confinement in Bed.—The patient is kept in bed for twenty-four hours prior to the operation. If a longer course of treatment is required, she should not be confined to bed until the day before the date fixed for the operation.

Regulation of the Diet.—A soft diet (see p. 111) should be given the day before the operation, and on the following morning a breakfast consisting of a cup of coffee, cocoa, or tea and a roll, or their equivalent in bread and milk, should be taken not less than three hours before the anesthetic is given. This will insure an empty stomach at the time of operation and obviate the danger of inhaling particles of food should vomiting occur.

The Bowels.—A bottle of citrate of magnesia is given the night before the operation, followed next morning by an enema of soapsuds and water. The magnesia should be taken on an empty stomach, and therefore at least three hours should have elapsed after taking food before it is administered.

The Bladder.—The urine should be voided naturally immediately before the patient is prepared for operation.

Sterilization of the Patient.—On the evening before the operation the patient is given a full warm bath and thoroughly scrubbed with soap. On the morning of the operation the hair on the mons veneris and the labia is cut close with scissors, the vulva and vagina irrigated with a solution of corrosive sublimate (1 to 2000), followed by sterile water, and the gluteal cleft, the perineum, the external organs, the anal region, and the inner sides of the thighs are sterilized as follows: Scrub the parts with a large gauze sponge dipped in liquid soap and warm water, and then douche them with a solu-

tion of corrosive sublimate (1 to 2000), which in turn is removed with sterile water. The parts are then dried, a large compress secured with a T-bandage is placed over the vulva, and the legs protected with sterile Canton flannel stockings which reach above the middle of the thighs. The hips and lower extremities are then wrapped in a sterile sheet, which is secured in front with safety-pins.

Anesthesia.—The patient is anesthetized in her bedroom or in a special room devoted to the purpose and placed on the operating table when she is unconscious. I never allow the anesthetic to be given in the operating room, as it interferes with the preparations which are being made and unnecessarily worries and excites the patient.

Immediately before administering the anesthetic the patient is given a hypodermic injection of $\frac{1}{6}$ of a grain of morphin and $\frac{1}{120}$ of a grain of strychnin to prevent post-operative shock and lessen the tendency to vomiting.

Final Sterilization of the Patient.—When the patient is brought into the operating room, the resident physician and the etherizing nurse place her on the table and arrange her feet in the stirrups. The general nurse then removes the sheet and the vulvar compress. The operator now pours two drachms of liquid soap into the vagina, and with a gauze sponge saturated with hot water and held in the grasp of dressing forceps mechanically sterilizes the vaginal canal by vigorous scrubbing. The vagina is then douched with a solution of corrosive sublimate (1 to 2000), followed by sterile water, and the vulvar canal, the perineum, and the anus are thoroughly scrubbed with a gauze sponge saturated with liquid soap and water, after which the parts are again irrigated with the sublimate solution and sterile water.

Protecting the Field of Operation.—A sterilized sheet is thrown over the knees and abdomen and its lower edge tucked up so as to expose the parts to view (see Fig. 29, p. 32).

PREPARATIONS FOR THE OPERATION.

Operating Room.—The operating room and its equipment are cleaned in the manner described on page 821, and sterile towels placed over the tops and shelves of the instrument and supply tables.

The following articles are then arranged on the supply table: Three pitchers, one each for cold, hot, and mixed water; three basins for general use; liquid soap; tincture of iodin and carbolic acid; the general irrigating apparatus; hypodermic syringe; cardiac and respiratory stimulants—strychnin, atropin, and nitroglycerin; a solution of corrosive sublimate (1 to 2000); and normal salt solution. A cylinder of oxygen gas is placed in a corner of the room ready for use.

The leg-holders are attached to the operating table, and a surgical pad placed in position with its apron falling into a bucket on the floor.

The instrument table is arranged as follows: On the shelf of the table is placed conveyance box No. 1 and the tray containing the instruments, ligatures, etc.; and on the top, conveyance box No. 2.

Wash Room.—The wash room and its equipment are cleaned in the manner described on page 822 and the following articles arranged on the table: Three pitchers, one each for cold, hot, and mixed water; a basin full of sterile water for the rubber gloves; and conveyance box No. 3.

On the marble slab of the washstand are placed three basins and the soap for cleaning the hands and forearms.

Contents of the Conveyance Boxes.—Three boxes are required for each operation. As stated elsewhere (p. 809), it is important to remember that steam will not circulate freely in the boxes if they are packed too tightly, and consequently the articles must be arranged as loosely as possible. The boxes are packed as follows and placed in the high-pressure steam sterilizer. The articles are placed in each box in the order in which they are given:

Box No. 1.—A T-bandage; a gauze compress; two gauze tampons; three dozen sponges; and a loosely rolled layer of absorbent cotton, 4 by 12 inches.

Box No. 2.—Eight towels; a glass catheter wrapped in gauze; and one sheet.

Box No. 3.—Three operating gowns, four pairs of rubber gloves, and six hand-brushes. The brushes and gloves are wrapped separately in a layer of gauze and secured with safety-pins so that they can be readily lifted out of the box.

FIG. 764.—POSE OF THE ASSISTANT WHILE WAITING FOR AN OPERATION TO BEGIN. Note that the elbows are resting on the hips and the hands held out from the body.

Instruments; Needles; Sutures.—The method of arranging these articles before placing them in the sterilizer is described under the Application of Antisepsis on pages 811 and 812. The original boxes containing the "Red Cross" catgut are placed on the supply table in the operating room.

Number of Assistants.—The number of assistants varies, and is given under the technic of the different operations. As a rule, the following assistants are required: An anesthetizer, one assistant, and a general nurse. In operations upon the pelvic floor and in other regions of the genital tract in which it is necessary to use several retractors and forceps, an additional assistant is required.

The anesthetizer gives his undivided attention to the anesthetic; the general nurse changes the water in the basins and brings whatever is needed during the operation from the supply table; and the assistants act solely as extra hands for the operator in holding retractors, forceps, etc. A nurse is not needed at the instrument table, as the operator takes what is required during the operation from the boxes and trays and threads the needles himself.

General Summary of the Preparatory Management.—The chief clinic nurse packs the conveyance boxes and sterilizes their contents; prepares and arranges the operating and wash rooms; and places the different articles on the supply table. When the operator arrives at the hospital, he selects the instruments, needles, and sutures that are required for the operation and hands them to the nurse for sterilization. The operator then enters the sterilizing room and the nurse opens the high-pressure steam sterilizer. He then takes out conveyance box No. 3, containing the operating gowns, the brushes, and the rubber gloves, and carries them to the wash room. He now takes off his ordinary clothes and dresses for the operation (see p. 814). The operator and his assistant then sterilize their hands and forearms and put on the rubber gloves and the operating gowns. The assistant now enters the operating room and stands with her back to the wall, as shown in Fig. 764, until the operation begins. The operator now takes the conveyance boxes (Nos. 1 and 2) out of the sterilizer and places them on the instrument

table. The general nurse, *under the eye of the operator*, then lifts the perforated

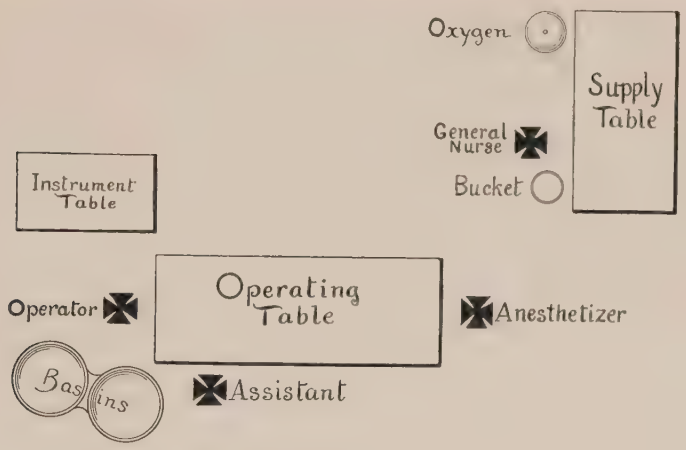


FIG. 765.—ARRANGEMENT OF THE OPERATING ROOM FOR A MINOR OPERATION.

trays out of the sterilizer, pours cold water over them, and places them in the receptacle on the instrument table.

When the patient is brought into the operating room, the resident physician and the anesthetic nurse place her on the table and arrange her feet in the stirrups. The general nurse then removes the sheet and the vulvar compress and the operator sterilizes the vagina and vulva and arranges the sheet around the seat of operation. He then puts on a clean pair of rubber gloves, places the assistants in the proper positions, and begins the operation.

Plan of Operation.—Fig. 765 gives a clear idea of the arrangement of the operating room and the positions of the operator, the assistant, and the general nurse.

The operator sits on a stool facing the vulva with the instrument table placed upon the left and the wash-basins filled with sterile water upon the right. The assistant stands at the patient's hips and the general nurse remains close to the supply table.

Visitors.—Visitors are not allowed in the operating room until all the preparations are completed and the operation is about to begin. They should not stand too close to the operator nor the field of operation and they should be cautioned not to touch anything in the room.

All spectators are required to wear linen dusters as a precaution against the possibility of carrying infection with their ordinary clothing. The dusters are laundried in the usual manner and kept in a convenient place.

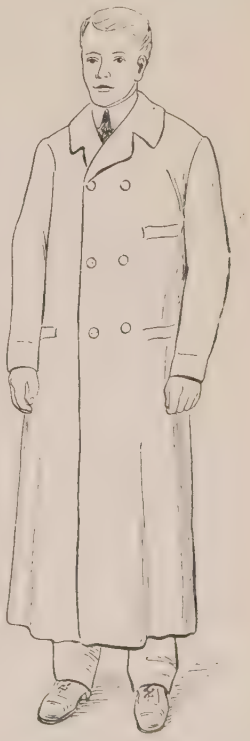


FIG. 766.—SHOWS THE LINEN DUSTER WORN BY VISITORS.

CHAPTER XLI.

TECHNIC OF ABDOMINAL AND PELVIC OPERATIONS.

PREPARATION OF THE PATIENT.

Examination of the General System.—The importance of a routine examination of the different organs of the body is discussed under the Preparation of the Patient for a Minor Operation, and need not, therefore, be repeated here (see p. 830). It is often necessary, however, to perform an immediate abdominal section to save life, and hence, unlike minor operations, we must choose the lesser of two evils and operate at times when the general condition of the patient is unfavorable. In a large proportion of pelvic and abdominal cases operative interference is not urgent, and there is usually sufficient time at our disposal to regulate the functions of the body when they are acting abnormally. The extra strain upon the kidneys must always be considered, and the urine should therefore be carefully examined to determine the presence of renal disease or insufficiency as well as the selection of the anesthetic. The condition of the lungs and the heart must also be ascertained, as the danger of post-operative pneumonia and cardiac failure must be guarded against not only in the selection of the anesthetic, but in the preparatory and subsequent treatment of the patient. We must, however, bear in mind that there is a class of cases in which the general condition of the patient will not improve until the cause is removed, and under these circumstances we cannot do more than temporarily stimulate the action of the heart and the kidneys. There is still another class of cases in which the condition of the patient can be greatly improved and the chances of operative success increased by treating the local cause as well as the general system. I refer to cases of bleeding uterine fibroids in which the patient has become exsanguinated and her power of resistance almost completely destroyed. If, under these circumstances, the uterine hemorrhages are controlled by appropriate treatment (see p. 385) and the general system is improved by internal medication and careful regulation of the diet, the bowels, and exercise, the patient will often be able in the course of a few weeks or months to stand the shock of an operation which would otherwise have been fatal.

The importance of making a blood examination prior to an operation is discussed in Chapter III.

Length of Preparation.—In all cases, except when operative interference is immediately demanded, the patient is placed under careful and systematic treatment for six days prior to the operation. Sometimes, however, it may be expedient to prolong the period of preparation on account of the condition of the patient, and in nervous women it may be advisable to shorten the time and operate within a day or two after the operation has been decided upon.

Confinement in Bed.—The patient is confined to bed during the entire period of preparation, except when she is given her daily bath; it is important to use the bed-pan in order to train her to empty the bladder and bowels in the recumbent position.

Regulation of the Diet.—During the first five days of the period of preparation the patient is given a liquid and soft diet (pp. 106 and 111), and for twenty-four hours preceding the operation the diet must be entirely liquid in character (p. 106); on the morning of the operation, three hours before the anesthetic is administered, a light breakfast is given, consisting of a cup of coffee, tea, or cocoa and a roll.

Alcoholic stimulants are not given unless there exists a special indication for

their use, and under these circumstances I allow the patient two or three milk-punches or egg-nogs daily or prescribe the use of sherry, port, madeira, or claret with the meals.

The object of placing the patient under a carefully regulated diet is to improve her general condition and to eliminate all articles of food that tend to produce flatulent distention or cause digestive disturbances.

The Bowels.—The bowels are freely opened at the beginning of the preparatory treatment and subsequently kept regular. I begin by giving 2 grains of calomel, and follow it with $\frac{1}{4}$ of a grain every half-hour until eight doses are taken. In two hours after the last dose is taken an ox-gall enema (p. 105), or one consisting of a pint of warm soap-water (100° F.), a tablespoonful of sulphate of magnesia, and a teaspoonful of turpentine, is injected into the rectum. The bowels are then kept opened daily with the following pill:

℞. Extracti cascaræ sagradæ,.....gr. ij
Resinæ podophylli,.....gr. $\frac{1}{8}$
Extracti belladonnæ,.....gr. $\frac{1}{10}$
M. et ft. pil. no. j.
Sig.—To be taken at bedtime.

Sulphate of strychnin (gr. $\frac{1}{20}$) is given by the mouth three times daily during the six days of preparatory treatment. It not only stimulates the heart and the nervous system, thus lessening the danger of operative shock, but it also keeps the intestines well contracted, which is an important factor, as tympany is one of the most serious complications that can occur either before or after an operation. If tympany continues notwithstanding the free evacuation and subsequent regulation of the bowels, the following capsule is given for three days prior to the operation:

℞. Saloli,.....gr. ij
Bismuthi subnitratis,.....gr. v.
M. et ft. capsula no. j.
Sig.—To be taken three times daily between meals.

On the evening preceding the operation a bottle of citrate of magnesia is given upon an empty stomach (three hours after taking food), and on the following morning the lower bowel is thoroughly evacuated by a large enema composed of a quart of warm water (100° F.) and Castile soapsuds.

Where there is decided pain or tenderness in the pelvis or over the lower abdomen, the use of a saline for two or three days in place of the laxative pill unloads the engorged blood-vessels and is often followed by the disappearance of the symptoms.

Salines should be given when the stomach is empty, either at bedtime or in the morning before breakfast, and the dose should be sufficient to move the bowels freely. I usually employ Epsom or Rochelle salt and also occasionally phosphate of sodium. The most palatable way of administering them is in an effervescent form, although the ordinary salts can be readily taken by most patients, dissolved in half a tumblerful of water.

The Kidneys.—The importance of knowing the exact condition of the kidneys prior to the operation, as well as the necessity of appropriate treatment where they are found to be diseased, has already been referred to. The treatment is naturally based upon general medical principles, and need not, therefore, be discussed here. Apart from the question of special forms of treatment, however, I keep the kidneys well flushed during the entire period of preparation by having the patient drink three or four pints of pure water daily as a routine practice. The kidneys are thus prepared for the extra work which they will be called upon

to perform, the urine is diluted, and the waste products are thoroughly and rapidly eliminated. The variety of water which is used and the method of its administration are discussed on page 98.

The Bladder.—The urine should be voided spontaneously or the bladder catheterized by the nurse immediately before the patient is prepared for operation.

Sterilization of the Patient.—The sterilization begins with the preparatory treatment, and consists in a daily full warm bath and local cleansing. The baths should be given preferably late in the afternoon, and the patient should remain immersed in the water for about ten minutes to soften the surface epithelium. She should then be washed from head to foot with soap and water and the abdomen and the mons veneris scrubbed with a sterile hand-brush. The surface of the body is then douched with clean water and thoroughly dried, after which the patient is placed back in bed. When the condition of the patient does not permit the bath being given in a tub, the mattress of the bed is protected with rubber sheeting and the entire surface of the body thoroughly sponged (p. 85), after which the abdomen and mons veneris are scrubbed with warm water and soap.

The last bath is given on the evening preceding the operation, and on the following morning the hair on the mons veneris and the labia is cut close with scissors (*not shaved*) and the vagina irrigated with a solution of corrosive sublimate (1 to 2000), followed by sterile water. A rubber sheet is then placed under the patient to protect the bed-clothing, and the abdomen and mons veneris are scrubbed for ten minutes with liquid soap and warm water. The soap is then removed by washing the surface with wet gauze sponges, a towel is thrown over the abdomen, and Canton flannel stockings are placed over the lower extremities. The nurse now sterilizes her own hands (*by mechanic sterilization*) and then thoroughly sponges the abdomen of the patient with alcohol and finally with a solution of corrosive sublimate (1 to 2000). A thick pad of sterile gauze is now placed over the abdomen and secured by a muslin bandage. A sterilized sheet is then wrapped around the patient, extending from the chest to the feet, and fastened in front with safety-pins. This dressing remains in position until the patient is placed on the operating table.

I do not have the mons veneris shaved because the skin retracts around the ends of the hairs, forming small pits which are more difficult to sterilize than the short hairs themselves.

Anesthesia.—The patient is anesthetized in her bed-room or in a special room devoted to the purpose, and immediately before administering the anesthetic she is given a hypodermic injection of $\frac{1}{6}$ of a grain of morphin and $\frac{1}{200}$ of a grain of sulphate of strychnin to lessen the tendency to vomit and prevent post-operative shock.

Final Sterilization of the Patient.—When the patient is brought into the operating room, the resident physician and the anesthetic nurse place her on the table and strap her legs to the Trendelenburg frame. The general nurse then unfastens the sheet which is wrapped around the patient and arranges its edges neatly so that they hang smoothly over the sides of the table. The gauze pad covering the abdomen is removed by lifting it up at its center, and the hands of the patient are secured by flexing the forearms on the arms and fastening the wrist-bands of the night-gown to the shoulders with safety-pins.

The operator now vigorously scrubs the field of operation with a hand-brush, soap, and warm water, and then sponges it with sterile water.

If the operation is one in which the vagina is to be subsequently opened,—as, for example, a complete hysterectomy,—it must be thoroughly sterilized in

the manner described on page 831 before the temporary dressings are removed from the abdomen.

FIG. 767.—ARRANGING A PATIENT ON THE OPERATING TABLE.
The sheet is removed, the arms fastened to the shoulders with safety-pins, the legs strapped to the Trendelenburg frame, and the gauze compress is being lifted off the abdomen.

Protecting the Field of Operation.—A folded sheet is placed across the thighs with its upper edge close to the lower margin of the mons veneris

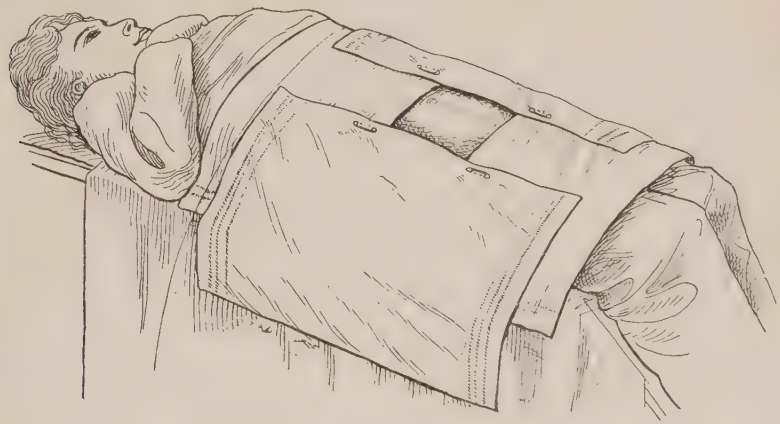


FIG. 768.—PROTECTING THE FIELD OF OPERATION WITH A SHEET AND TOWELS.

and the field of operation surrounded by four towels which are fastened together by safety-pins.

PREPARATIONS FOR THE OPERATION.

Operating Room.—The operating room and its equipment are cleaned in the manner described on page 821 and sterile towels placed over the tops and shelves of the instrument and supply tables.

The following articles are arranged on the supply table: Three pitchers, one each for cold, hot, and mixed water; three basins for general use; liquid soap; abdominal irrigator; hypodermic syringe; cardiac and respiratory stimulants—strychnin, atropin, and nitroglycerin; the transfusion apparatus and normal salt solution; an alcohol lamp; and adhesive plaster.

A cylinder of oxygen gas is placed in a corner of the room ready for use.

The instrument table is arranged as follows: On the top of the table is placed conveyance box No. 1 and the tray containing the instruments, ligatures, etc., and on the shelf conveyance box No. 2.

Wash Room.—The wash room and its equipment are cleaned in the manner described on page 822 and the following articles arranged on the table: Three pitchers, one each for cold, hot, and mixed water; a basin containing sterile water for the rubber gloves; and conveyance box No. 3.

On the marble slab of the washstand are placed three basins and the soap for cleansing the hands and forearms.

Contents of the Conveyance Boxes.—Three boxes are required for each operation. They are packed as follows and placed in the high-pressure steam sterilizer. The articles are placed in each box in the order in which they are given.

Box No. 1. Abdominal dressings (p. 827); two gauze tampons; glass and rubber drainage-tubes of different sizes wrapped in gauze; eight small and four large gauze pads; four dozen gauze sponges; and eight safety-pins folded in gauze.

Box No. 2. Ten towels; one sheet; and one hand-brush.

Box No. 3. Three operating gowns; four pairs of rubber gloves; and six hand-brushes. The brushes and gloves are wrapped separately in a layer of gauze and secured with safety-pins so that they can be readily lifted out of the box.

Instruments; Needles; Sutures.—The method of arranging these articles before placing them in the sterilizer is described on pages 811 and 812. The original boxes containing the "Red Cross" catgut are placed on the supply table in the operating room.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse are required.

The anesthetizer gives his undivided attention to the administration of the anesthetic, and the general nurse changes the water in the basins and brings whatever is needed from the supply table. The assistant acts solely as a pair of extra hands for the operator, and under no circumstances is she allowed to take any part in the operation except when told specifically what to do from time to time.

General Summary of the Preparatory Management.—Before the surgeon arrives at the hospital the chief clinic nurse packs the conveyance boxes and sterilizes their contents, but does not open the door of the sterilizer. She also prepares the operating and wash rooms and arranges the requisite paraphernalia for the operation in their proper places. As soon as the surgeon reaches the hospital he selects the instruments, needles, and sutures that are required and hands them to the nurse for sterilization. He then goes to the sterilizing room and the nurse opens the high-pressure steam sterilizer, from which he takes conveyance box No. 3 and carries it into the wash room. He now takes off his clothing and puts on the operating suit. He and his assistant then prepare their hands and put on the gloves and gowns. The assistant then goes into the operating room and stands with her back to the wall, as shown in Fig. 764, until the operation begins. The operator now removes the conveyance boxes

(Nos. 1 and 2) from the sterilizer and places them on the instrument table. The general nurse, *under the eye of the surgeon*, then lifts the tray out of the sterilizer and places it in the receptacle on the instrument table containing warm sterile water. The patient is now brought into the operating room and placed on the table by the resident physician and the anesthetic nurse. The general nurse then unfastens the sheet which is around the patient's body and pins the wrist-bands of the night-gown to the shoulders. The operator then scrubs the abdomen, arranges the towels around the seat of operation, and puts on a fresh pair of gloves. He then places the assistant on the opposite side of the operating table and begins the operation.

Plan of Operation.—Fig. 769 gives a clear idea of the arrangement of the operating room and the position of the operator, the assistant, and the general nurse.

The operator stands on one side of the patient and the assistant on the other, and the general nurse is placed close to the supply table. The instrument table, which contains everything that is directly used during the operation, is within

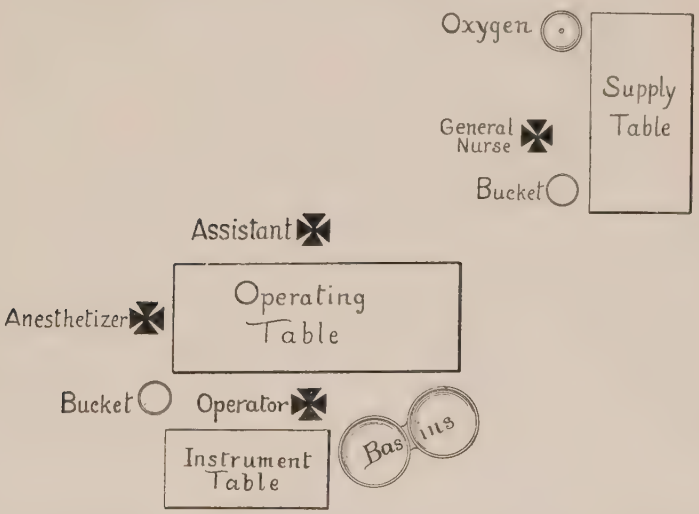


Fig. 769.—Arrangement of the Operating Room for an Abdominal or Pelvic Operation.

easy reach of the surgeon, and next to it is placed the washstand with basins containing sterile water for washing the hands. There is nothing on the assistant's side of the operating table except a washstand with a basin containing sterile water, which she uses to keep her hands clean.

Visitors.—Visitors are not admitted to the operating room until all the preparations are completed and the operation is about to begin. They are required to wear linen dusters (see Fig. 766), which are laundried in the ordinary manner after they are used and then put in a convenient place until needed.

Precautions Against Infection.—The old saying that "the strength of a chain is its weakest link" may also be applied to the technic of antiseptic surgery, and unless this truth is grounded in the inner consciousness of an operator, errors are sure to occur which may at times cost a life. No detail of antisepsis is therefore too small and no precaution too insignificant for a surgeon to neglect, as the most careful preparation will go for naught if infection

gains an entrance through some unguarded channel. The operator is responsible for the success of an operation, and should a preventable infection occur, he must place the blame where it belongs—upon himself.

In addition to the ordinary details of antisepsis, I have adopted the following methods to guard against infection:

1. A personal supervision of every article that is sterilized.
2. Personally overseeing the preparations of the assistants.
3. A minimum number of assistants at an operation.

The first of these methods entails additional work upon the operator without, however, encroaching upon his time, as the sterilization is completed in the high-pressure steam sterilizers before he arrives at the hospital and the ligatures and instruments are boiled while personal preparations are being made for the operation. I have been frequently impressed with the careless handling by the nurses or assistants of the various articles after they have been taken from the sterilizers, and there is no doubt in my mind but that infection is often due to this cause.

The second of these methods is important, as it is a constant reminder to the assistant of the necessity of a thorough antiseptic technic and it also prevents the possibility of errors occurring in the details of the preparation. Again, if the assistant is required to stand in a fixed position after she is completely prepared for an operation, there is no danger of rubbing against infected objects or becoming contaminated in other ways.

The number of assistants is a matter of vital importance in the conduct of a modern operation, and every surgeon should endeavor to depend upon himself for many of the details that are frequently relegated to others. A large corps of assistants must necessarily add to the chances of infection and the dangers of an operation, because the possible sources of contamination are increased in proportion to the number of individuals that come in contact with the field of operation. The truth of this statement is self-evident, and yet it is not uncommon for a surgeon to have, in addition to his first assistant and general nurse, a nurse to hand the instruments, another to pass the sponges, and still another to thread the needles, all of which he should do himself. In my abdominal operations I have only one assistant who comes in contact with the field of operation, and she is only employed to hold the handles of such instruments as retractors and forceps, so that practically her hands never touch the wound. The anesthetizer naturally cannot affect the aseptic conditions one way or the other, and the general nurse is therefore the only remaining individual connected with the operation who could possibly cause infection. While her hands are clean, they are not and cannot be sterile, for the simple reason that she must turn the spigots of the water sterilizers in filling the pitchers; handle instruments, such as a Paquelin cautery, etc., which cannot be sterilized; and perform various other duties which would necessarily cause contamination from a surgical standpoint. If the operator fully appreciates the fact that the hands of the general nurse are not sterile, and educates her, therefore, never to touch anything that comes in contact with the wound, she is at once eliminated as a possible source of infection, and cannot be considered as being connected with the field of operation. The general nurse in handling a basin always holds it between her hands, so as not to touch the inside; and in mixing water she judges of the temperature by placing her hand on the outside of the pitcher or reservoir, leaving it to the operator to finally decide whether it is too hot or too cold. On the other hand, however, nurses who pass the instruments or the sponges or who thread the needles are in communication with the field of operation, be-

cause these articles which finally come in contact with the wound have been handled by them.

By placing the table which holds the instruments, ligatures, sponges, dressings, etc., within easy reach I am able to dispense with the services of an extra nurse and rely entirely upon myself for handling these articles. After a surgeon has trained himself there is no appreciable loss of time involved by this technic, and the elimination of a possible source of infection is distinctly in favor of the patient. There is no operation in the whole range of abdominal surgery which cannot be performed by a surgeon of ordinary dexterity with one assistant and a general nurse. One of the reasons why some operators depend so largely upon assistants is that they do not study simplicity in technic and devise methods by which operative details can be rapidly accomplished. Thus, for example, there is nothing more annoying and which takes up more time than threading a needle with silk during an operation, unless it is done in the proper manner, as the surgeon's hands are sticky, the silk is wet and limp, and it is only after repeated trials that the thread is finally coaxed through the eye of the needle. If, however, the end of the ligature is passed through the flame of an alcohol lamp and its tip charred, there is no difficulty whatever in threading the needle and proceeding with the operation without delay (the method is described on p. 907).

AFTER-TREATMENT.

Preparation of the Bed and the Room.—So soon as the patient is taken to the operating room preparations are made by the nurse to receive her after the operation is finished. The bed is prepared as follows: The mattress is covered with a clean muslin sheet; next a rubber sheet is thrown across the bed, and, finally, a draw-sheet is placed over it and securely fastened with safety-pins. A single blanket and a sheet are neatly folded and placed on the back of a chair ready to throw over the patient when she is put to bed. Hot-water bags or bottles are prepared and wrapped in flannel ready to place next to the patient if needed. The room is darkened and the temperature kept between 70° and 75° F. A cylinder of oxygen gas and a bowl of ordinary vinegar are placed in the room ready to use when the patient returns from the operation.

Recovery from the Anesthetic.—The patient is placed in bed upon her back, with the head low, and a blanket thrown over her. So soon as she has been properly arranged in bed the nurse administers oxygen gas by holding the nozzle of the apparatus about two inches from the nostrils and moving it with the face as the patient rolls her head from side to side. Oxygen can also be administered with a soft-rubber mask which fits over the nose and mouth and is connected with the tubing attached to the cylinder. This is an excellent method of administering the gas when the patient is unconscious and a quick, decided action is desired (Figs. 770 and 771).

When consciousness begins to return, the oxygen is discontinued, as it generally annoys the patient, and vinegar is substituted. It is poured on a soft piece of muslin, folded in several layers, which is held over the patient's face so that she can inhale the fumes until full consciousness returns. The use of oxygen after an abdominal operation decreases the tendency to shock, shortens the period of unconsciousness, and in most cases prevents the occurrence of nausea and vomiting or lessens their severity. The inhalation of the fumes of vinegar is one of the very best remedies to prevent nausea and vomiting, and if the oxygen is not available, it may be used as a substitute so soon as the patient is removed from the operating table.

When consciousness has fully returned and reaction has taken place, the

vinegar is discontinued and the patient is made as comfortable as possible. A sheet is now placed next to the body, the face and hands are sponged with cold water, and the mouth swabbed out with a handkerchief soaked in ice-water.

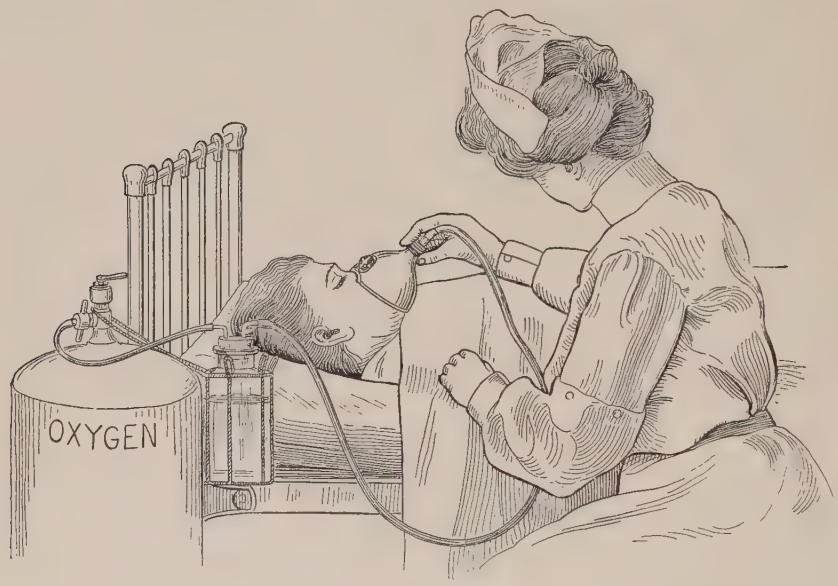


FIG. 770.—ASHTON'S METHOD OF ADMINISTERING OXYGEN WITH A SOFT-RUBBER MASK (page 841).

Position of the Patient.—During the first twenty-four hours the patient is kept upon her back with her head low, and if she complains of much pain or distress it is generally relieved by carefully raising the knees and placing a soft pillow under them.

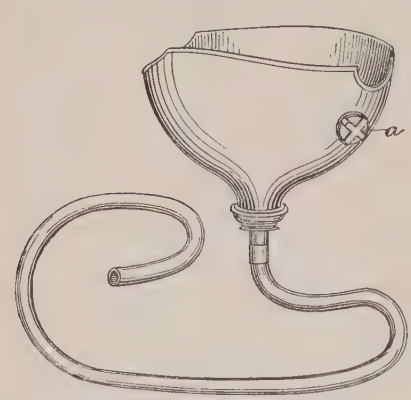


FIG. 771.—ASHTON'S SOFT-RUBBER MASK FOR ADMINISTERING OXYGEN (page 841).
The mask is used by throat specialists for inhaling medicated vapors.

After the first day the patient's head is raised on a pillow and her knees drawn up or extended as she may desire. My rule is to change the position of the patient from her back to her side after the first forty-eight hours, except in cases in which drainage is employed. The nurse raises the shoulder and hip and soft pillows are arranged under the patient so that her body rests on the opposite side. After she wearies of this position the pillows are gently removed and placed under the opposite shoulder and hip or the patient is allowed to rest upon her back again.

Care of the Bed.—The under-sheet should not be changed for one week, after which time the patient is gently raised from the bed while it is removed and a clean one put in its place. The draw-sheet and pillow-case are changed every day or oftener if they become soiled. The nurse should keep

the bed-clothing smooth and neat and the pillow well shaken and properly placed under the patient's head (Fig. 773).

Special Nursing.—The patient must not be left alone for a moment after the operation until she regains complete consciousness. This rule admits of no exceptions, and unless it is scrupulously obeyed serious accidents are bound to occur. In the case of a ward patient, if all goes well the special nurse is taken off soon after the effects of the anesthetic have passed away and vomiting has ceased. If the patient is very nervous and the stomach is irritable, the nurse remains on special duty until the following morning. A nurse is always kept on duty with a private-room patient for the first twenty-four hours, and after that time she receives general nursing. It is always better, however, to have a special nurse in attendance for the first week, and even during the entire convalescence, if the patient can afford the extra expense.

FIG. 772.—METHOD OF RESTING A PATIENT UPON HER SIDE BY PLACING A PILLOW UNDER THE OPPOSITE SHOULDER AND HIP.

Post-operative complications demand special attention, and it may be necessary in some cases to have a day and a night nurse in attendance.

Pain and Restlessness.—More or less pain is usually felt during the first twenty-four hours after operation, and in some cases it becomes so severe as to require treatment. Morphin is not administered, if it can be avoided, on account of its tendency to unsettle the stomach, decrease the peristaltic action of the bowels, increase the thirst, and diminish the quantity of urine excreted, nevertheless when the pain is severe a hypodermic injection of morphin (gr. $\frac{1}{8}$ to $\frac{1}{6}$) is given, and repeated if necessary. Under these circumstances the slight theoretic harm resulting from small doses of the drug is more than overbalanced by the good obtained in preventing the exhaustion and depression which follow severe suffering.

As a rule, the pain which occurs during the first twenty-four or forty-eight

hours is traumatic in origin, and therefore the use of morphin is indicated, which is not the case, however, when the symptom begins or continues after that time. It is then usually due to inflammation, and the administration of morphin is contraindicated, as every effort must be made to freely evacuate the intestines.

The restlessness which sometimes occurs during the first twenty-four or forty-eight hours is usually accompanied by pain, and is relieved by the morphin which is administered for the latter symptom. The use of sedatives is contraindicated for the relief of restlessness, as they unsettle the stomach and interfere with digestion. A sponge bath (see p. 85) under these circumstances often quiets the patient and she falls into a natural sleep. A change in position is also beneficial, and a patient who has been previously restless and fretful becomes calm and contented when the knees are drawn up or she is rolled over upon her side. The backache which is often experienced after an operation, and which causes more or less restlessness and severe distress, is generally relieved by placing a soft pillow or a hot-water bag under the small of the back. When this fails to give relief,

FIG. 773.—METHOD OF CHANGING THE DRAW-SHEET BY ROLLING THE PATIENT UPON HER SIDE AND THEN BACK TO THE DORSAL RECUMBENT POSITION (page 843).

the pain usually disappears at once after the position of the patient is changed and she is placed upon her side with the hip and shoulder supported with pillows. And, finally, a gentle massage of the upper and lower extremities is often followed by a quieting effect and relieves the restless condition.

Nausea and Vomiting.—The stomach is usually more or less irritable for the first twenty-four hours until the effect of the anesthetic has passed off, and it is not uncommon for it to continue in that condition for forty-eight hours, and in rare instances even so long as one week. As a rule, however, when nausea and vomiting continue beyond forty-eight hours it is a serious symptom, and may indicate a beginning peritonitis.

The treatment of ether vomiting is very simple and consists principally in putting the stomach at rest. I never allow anything to be taken by the mouth so long as the nausea and vomiting continue, and if the gastric irritability is prolonged beyond twenty-four hours, the stomach is thoroughly washed out with

warm normal salt solution. An ounce of Epsom salt dissolved in water is then injected through the tube before it is withdrawn, and a nutrient enema given every four hours until the gastric disturbance disappears. Small quantities of egg-albumen or Valentine's meat-juice are then cautiously administered by mouth, and if necessary a dry champagne may also be used.

An ice-bag or a mustard leaf applied over the epigastrium is often very comforting to the patient, and not infrequently relieves the nausea. In some cases the vomiting disappears almost at once when the position of the patient is changed and she is placed upon her side and supported with pillows. And, finally, inhalations of the fumes of vinegar or oxygen gas often give relief and quiet the stomach.

Thirst and Drink.—Excessive thirst is prevented in a large proportion of cases by drinking large quantities of water during the preparatory course of treatment (see p. 835) and by giving a high rectal injection of a quart of hot normal salt solution before the patient leaves the operating table.

No fluid is allowed by the mouth during the first twenty-four hours, and after that time if the patient's stomach is quiet a teaspoonful of hot water is given every fifteen or twenty minutes, gradually increasing the amount if the fluid is not rejected. Hot water under these circumstances is better than cold, as the latter is apt to cause vomiting by accumulating in the stomach, and besides it does not allay thirst so well. Allowing the patient to eat cracked ice is objectionable for the same reasons, and should not be permitted. After the bowels have been thoroughly opened the patient is gradually allowed to increase the quantity of water until she is taking a normal amount. The patient is always encouraged to drink water freely during convalescence, as it flushes the kidneys and dilutes the urine. Distilled, Poland, Bedford, or Buffalo lithia water is agreeable and beneficial to most patients, and for those who prefer a sparkling water I use Apollinaris or a siphon of soda, Vichy, or Seltzer water.

If the patient complains of thirst during the first twenty-four hours after operation she is given a low enema of six ounces of hot normal salt solution every three hours and her lips and tongue are moistened with a piece of soft muslin wrapped around a small bit of ice or dipped in ice-water.

The Bladder.—The bladder is catheterized in eight hours after the operation and then three times in every twenty-four hours until the urine is voided naturally. As a rule, the function of micturition is not restored for at least one or two days after the operation, and it is therefore necessary to use the catheter during this period, but occasionally the urine is passed spontaneously soon after the patient recovers from the anesthetic.

The Kidneys.—There is always a diminished amount of urine excreted for the first three or four days after an operation, and not infrequently there is more or less vesical irritability caused by its highly concentrated condition. A careful record is kept of the amount of urine excreted every twenty-four hours, as well as its specific gravity and general analysis. If the amount of urine excreted in twenty-four hours falls below 20 or 24 ounces during the first few days, the kidneys are stimulated by a rectal injection every twelve hours of a pint of normal salt solution (118° F.) and the ingestion by the stomach of two or three glasses of pure water daily.

The Bowels.—My experience has led me to believe in the advantages of an early catharsis, and I therefore begin the administration of calomel twenty-four hours after the operation. Two grains of the drug are given at once and followed by ¼ of a grain every half-hour until eight doses are taken. In three hours after the last dose is administered an enema consisting of one pint of warm soap-water (100° F.), one ounce of glycerin, and a tablespoonful of sulphate of magnesia is injected into the rectum. If this is not followed by a movement within two hours, an ounce of pure glycerin is injected into the bowel; and at the

end of another hour if no result is produced, an ox-gall enema (see p. 105) is given.

After the bowels have been freely moved they are kept opened daily by the administration of the following pill:

℞. Extracti cascaræ sagradæ, ... gr. ij
Extracti colocynthidis compositæ, ... gr. iiss
Extracti belladonnæ, ... gr. $\frac{1}{10}$
M. et ft. pil. no. j.
Sig.—To be taken at bedtime.

If the bowels are not moved spontaneously next morning, a simple enema consisting of a pint of warm soap-water (100° F.) and an ounce of glycerin is given toward the middle of the day.

The occasional use of a saline is often beneficial during convalescence, and is given as a substitute for the laxative pill. The salts are given either at bedtime or in the morning before breakfast, and they are usually administered in an effervescent form, although the ordinary preparations are readily taken in half a tumblerful of water. The best results are obtained from Epsom or Rochelle salt and phosphate of sodium.

The routine practice of obtaining an early movement of the bowels after an operation is contraindicated in cases in which the patient is in a very weakened condition, and under these circumstances it is better to wait for two or three days before attempting to produce catharsis. It should then be accomplished by mild means, so as not to cause free purgation, which is likely to exhaust the patient and increase her asthenic condition. In these cases the laxative pill referred to above should be substituted for the calomel and given every other day, followed in the morning by a simple enema of soapsuds and warm water if the bowels are not opened spontaneously. The administration of salines is also contraindicated until the condition of the patient improves, and they should then be given only in mild laxative doses.

Tympany.—Early catharsis, as a rule, prevents the occurrence of tympany, and what little gas does accumulate from time to time in the intestines is expelled by the daily laxative or enema. Sometimes, however, patients are considerably annoyed by the retention of flatus in the rectum, which they are unable to expel, probably on account of the fear of injuring the wound by straining, and also on account of the pain which the effort causes. Under these circumstances the rectal tube is passed into the rectum several times a day or left in it for an hour or two at a time; usually this gives the patient complete relief. If the flatus is higher up in the bowel, a change in the position of the patient or the introduction of the rectal tube into the sigmoid is generally followed by the expulsion of the gas and the disappearance of the symptom.

Diet.—Nothing is given by the mouth until the bowels are moved (which is usually in about thirty-two hours), after which time if the stomach is quiet the patient is allowed egg-albumen alternating with liquid peptonoids, Valentine's meat-juice, or beef-tea. These articles are given in small quantities every two or three hours, and continued, if they agree with the stomach, until the next day, when the patient is allowed to select from the full list of liquid diet. The liquid diet is continued for one week, and if all is doing well, the patient is then placed upon a soft diet, which is changed to a convalescent diet on the fifteenth day.

If the patient is feeble or exhausted after an operation, she should be given food at once by the rectum, and sometimes it is also advisable to administer small quantities of concentrated nourishment by the mouth so soon as she regains consciousness from the anesthetic. For this purpose nothing is better than Valentine's meat-juice or Bovinine given in very small quantities and repeated every half-hour.

Alcoholic stimulants are used when indicated, and they are usually given in the form of whisky, brandy, or a dry champagne.

A full list of liquid, soft, and convalescent diets and nutrient enemata, as well as their preparation, is given in Chapter IX, page 106.

Milk is not given during the first two weeks after an abdominal operation, unless it is peptonized, as it nearly always causes intestinal flatus and increases the tendency to nausea and vomiting.

Temperature, Pulse, Respirations.—The temperature, the pulse, and the respirations are recorded every six hours for the first three days, and then, if all goes well, they are only taken in the morning, at noon, and in the evening.

I prefer the temperature taken in the rectum, as it is more accurate than the mouth and mistakes are less likely to be made. The temperature in a normal case rarely goes beyond 101° or 102° F., and in most instances it does not reach higher than 100° F. It attains its highest point, as a rule, on the second day, and after the bowels are moved in the evening it generally drops to about 99° F., or normal. If, however, the temperature remains elevated after free catharsis and gradually rises, it is probably due to infection of the peritoneum or some other serious complication. A sudden elevation in temperature occurring during the second week is generally caused by beginning suppuration in the abdominal wound or a circumscribed infection in the peritoneal cavity.

The pulse, as a rule, does not go much beyond 100 beats during the first two or three days, even after a severe operation, and it usually drops, after free catharsis, on the evening of the second day. A pulse beyond 100 beats after the second day is always a cause for uneasiness unless the operation was unusually severe and it had not taken a previous drop. A rising pulse after the bowels have been evacuated indicates infection, especially if it is associated with tympany and a moderately high temperature. If the pulse gradually rises to 120 beats or more after the second day, the case is serious, and the patient, as a rule, is in danger. A gradually rising pulse associated with abdominal distention and elevated temperature and a flushed and anxious countenance indicates a fatal ending.

The Use of Sulphate of Strychnin.—One-twentieth of a grain of sulphate of strychnin is given three times a day during the first two weeks for its tonic effect upon the heart and nervous system and to stimulate the peristaltic action of the intestines. It is administered hypodermically during the first two or three days and then by the mouth if the stomach has become thoroughly settled.

Toilet of the Patient.—The patient is kept clean and comfortable from the beginning, and on the evening of the second day she is given a general sponge bath. The bath is repeated every day during convalescence, and soap and water are used to keep the hands and other parts of the body clean. Until the patient can be rolled over on her side the back cannot be sponged, and the nurse should not attempt to wash this part of the body without authority from the surgeon. Local cleanliness is very important, and the anal and vulvar regions should be regularly washed with soap and warm water after the patient is able to be placed on a bed-pan. After the first week, if all goes well, a vaginal douche of two quarts of hot normal salt solution is given every day to keep the vagina clean and increase the comfort of the patient. The teeth and mouth are washed several times daily with a soft piece of muslin dipped in cold water to which has been added a small quantity of listerine or an aromatic tooth-wash. After the patient is convalescent she should scrub her teeth night and morning with a tooth-wash and rinse out her mouth several times a day with water and listerine. The nurse should comb and braid the patient's hair every day.

The night-dress and undershirt of the patient, which should be made to open in the back, are changed once a day, or at other times, should they become soiled.

Visitors.—Absolute quiet and rest are essential after an abdominal operation, and the patient must not be disturbed during the first week by visitors. After this time, if no complications have occurred, she is allowed to see one or two persons a day for a few minutes, and during the third and fourth weeks the number of visitors is gradually increased.

Sometimes it may be necessary to allow the husband or a close relative to see the patient soon after the operation, and under these circumstances the visits must be made with the surgeon or his assistant.

Care of the Wound.—The dressings are not disturbed until the stitches are removed unless the patient complains of pain in the incision or the temperature becomes elevated. Under these circumstances the wound is inspected at once to exclude the possible presence of an abscess in the abdominal incision.

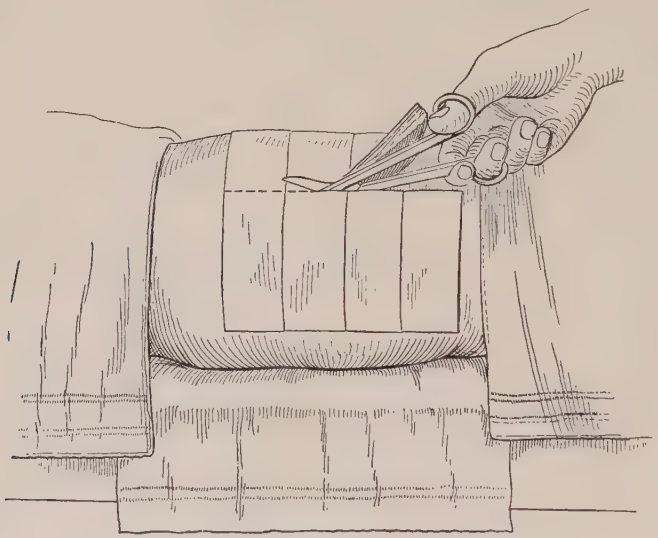


FIG. 774.—APPLYING FRESH DRESSINGS TO A WOUND.
The adhesive straps are being cut at the edge of the dressings.

On the eighth day the stitches are removed and fresh dressings applied. If all goes well, the wound is dressed twice a week; and when the patient leaves the hospital, the incision is protected by a piece of soft muslin which is held in position by the abdominal bandage.

The wound is dressed as follows: Cut the adhesive straps at the edge of the dressings on each side of the abdomen (Fig. 774) and remove the compress (Fig. 775). The wound is then washed with hydrogen peroxid, followed by a solution of corrosive sublimate (1 to 1000); a large gauze pad saturated with the sublimate solution is now laid over the incision, and fresh section dressings applied which are secured by placing strips of adhesive plaster over the old ones attached to the sides of the abdomen (Fig. 776).

When the stitches are removed, the wound may become infected by dragging septic material or dried serum through the suture tracts. To prevent this accident occurring, the following method is employed: Bathe the wound freely with hydrogen peroxid, and after it is thoroughly cleaned place directly over the in-

Fig. 775.—Applying Fresh Dressings to a Wound.
The compress is being removed.

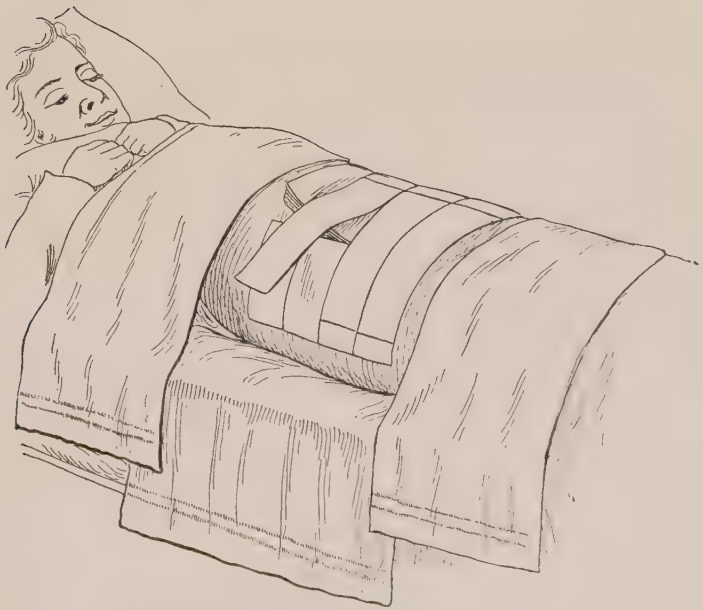


Fig. 776.—Applying Fresh Dressings to a Wound.
The fresh dressings are being secured by adhesive straps.

cision a piece of absorbent cotton saturated with a solution of corrosive sublimate (1 to 1000) which is allowed to remain for five minutes. Each suture is then seized with dressing forceps at its point of entrance, withdrawn about ¼ of an inch, and cut close to the skin below the serum line. Traction is then made and the suture slowly withdrawn from the wound.

Getting Out of Bed.—I allow my patients to get out of bed on the twenty-first day and to return home at the end of the fourth week. A long rest in bed under the circumstances, is not only beneficial, as many of these patients are neurasthenic and exhausted from long suffering, but it also guards against ventral hernia, which is likely to occur from getting up too soon after an abdominal operation.

Bandage.—An abdominal bandage is worn for one year from the time the patient gets out of bed. It should be ordered and made by the twenty-first day, so that it will be on hand when needed. If, however, the bandage is not available at that time, a piece of canton flannel large enough to encircle the abdomen and extend from the hips to the floating ribs will answer very well as a temporary substitute.

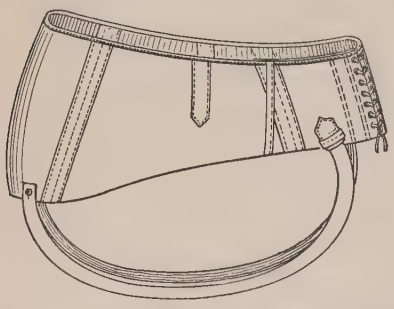


FIG. 777.—ASHTON'S MUSLIN ABDOMINAL BANDAGE.

The bandage may be made to lace at the back, as shown in the illustration, or to buckle at the back or at both sides; the latter method is the most satisfactory.

The bandage which I employ is made of muslin and cut to fit the figure closely, being held securely in position by straps which pass between the thighs. It can be readily washed, and by having two bandages one is always clean. The bandage is removed when the patient bathes and when she goes to bed at night. The elastic bandages which are generally used to support the abdominal walls after an operation are not only useless, as the rubber soon becomes overstretched and rotten, but they also absorb the perspiration and become filthy in a short time.

A bandage cannot ordinarily support the incision and prevent the formation of a ventral hernia, but I believe it to be of service when any extraordinary strain is put upon the abdominal walls, and, besides, its presence is a constant reminder to the patient of the tender condition of the wound.

Exercise.—For a year after the patient leaves the hospital she must avoid all forms of work or exercise which put an extraordinary strain upon the abdominal walls. During the first six months the patient must limit herself to driving and short walks, and after that time the game of golf, played in moderation, is the most attractive as well as the most beneficial form of exercise she can take.

POST-OPERATIVE COMPLICATIONS.

PERSISTENT NAUSEA AND VOMITING.

If vomiting continues after an abdominal section beyond forty-eight hours, it is usually a serious symptom, and may indicate a beginning peritonitis or a renal insufficiency. In nervous women, however, vomiting may continue for several days, and unless it is relieved a fatal ending may result from exhaustion.

Again, the vomiting may cease within a few hours after operation and return on the second or third day. Under these circumstances it is often the first symptom of a septic infection, and is usually associated with distressing retching and epigastric distention.

Treatment.—As in the case of simple ether vomiting, all forms of food must be withheld from the stomach, gastric lavage employed (see p. 844), and the strength sustained by nutrient enemata and hypodermic injections of strychnin (gr. $\frac{1}{60}$ every four hours). It is important to move the bowels freely, and if the Epsom salt which is injected into the stomach after the lavage does not empty the intestines, $\frac{1}{10}$ of a grain of calomel combined with 2 or 3 grains of bicarbonate of soda is given every half-hour until ten doses are taken. One hour after the last powder is given an enema consisting of soapsuds, turpentine, and warm water is injected into the rectum. Sometimes it may be necessary to use a more stimulating injection, such as an ox-gall enema (see p. 105), or, again, good results may follow the administration of a Seidlitz powder.

In some cases relief is obtained by placing a turpentine stupe, a hot-water bag, a mustard plaster, a small fly-blister, or an ice-bag over the epigastrium; in others marked benefit may be derived and the nervous irritability of the stomach lessened by giving 20 grains each of bromid of soda and chloral by the rectum in three ounces of warm water or milk. The enema may be repeated every three or four hours, according to the indications and the effects produced. The administration of remedies by the mouth are generally of but little use, although in some cases marked results may be obtained and the gastric symptoms greatly benefited or relieved altogether. The following formula may have a sedative effect upon the stomach and relieve the nausea:

℞. Acetanilidi,.....gr. iiss
Cerii oxalatis,.....gr. v
Cocainæ hydrochloratis,.....gr. $\frac{1}{4}$
M. et ft. cachet no. j.
Sig.—One cachet every two or three hours as indicated.

If the patient is unable to swallow a cachet, the remedies may be administered in the form of a powder which is placed dry upon the tongue and taken with a little hot water.

Cocain may be administered alone, either in pill form (gr. $\frac{1}{4}$ every two or three hours) or in solution (gr. $\frac{1}{20}$ every hour), with decided benefit, and sometimes small doses of tincture of nux vomica (1 drop every half-hour in a teaspoonful of hot water), or $\frac{1}{100}$ of a grain of nitroglycerin, repeated in four hours, may stop the nausea and vomiting. In cases in which there is no evidence of septic peritonitis morphin may be given hypodermically to produce sleep and relieve the general nervous irritability. Under these circumstances the administration of the drug is often followed by the prompt disappearance of the gastric symptoms, and in the course of twelve or twenty-four hours the stomach is able to retain small quantities of food.

In cases in which the vomiting continues despite the above plan of treatment it may be necessary to repeat the gastric lavage and wash out the stomach every three or four hours with warm saline solution. In most cases, however, the first lavage is followed by permanent relief, and the stomach is able to retain small quantities of food.

If a patient suffering with persistent vomiting expresses a desire for some special article of diet, it is usually best to allow her to try it, as nausea has often been relieved in this way and the stomach settled when other means have completely failed to give results.

DELAYED BOWEL MOVEMENT.

In the majority of cases the bowels are opened as the result of routine medication on the evening of the second day after operation, but occasionally the movement may be delayed for several days, even where no serious complication, such as peritonitis or mechanic obstruction of the intestines, is present.

These cases are due to paralysis or spasm of the intestines, and usually follow operations in which there has been more or less traumatism, exposure of the abdominal viscera, or sudden relief from tension after the removal of a large tumor of the pelvis or abdomen.

During the first twenty-four hours after an abdominal section, if the case is doing well, there is an absence of peristaltic action (*aperistalsis*) and the intestines are at rest. There are several factors concerned in bringing about this condition. In the first place, the preparatory evacuation of the bowels by catharsis, and the use of a liquid diet and the absence of food immediately after section, remove the intestinal contents as a factor in stimulating peristaltic movements. And, again, the rest in bed before operation and the enforced quiet afterward tend to keep the intestines inactive and prevent peristalsis. This condition is not only observed after an abdominal section, but also after parturition, and, in fact, in all cases in which the patient is required to lie quietly in bed for some time. The well-known fact that changing the position of a patient in bed relieves tympany in some cases and favors the downward movement of gas shows the effect of exercise upon intestinal activity. If, therefore, any cause for paralysis or spasm of the intestine is present at the time of operation, the peristaltic action of the bowel is interfered with, and several days may elapse before the normal conditions are restored and a movement takes place.

Diagnosis.—The condition must be distinguished from septic peritonitis and mechanic obstruction of the intestine.

In cases of delayed bowel movement the pulse is but slightly affected and seldom rises above 90 beats per minute. There is generally a slight fever and the temperature ranges from 99° to 101° F. Tympany is usually absent or only slight in amount, the general condition of the patient is good, and the stomach is quiet, as a rule, although in some cases there may be a little nausea.

A high temperature and a weak, rapid pulse, associated with marked tympany and vomiting, indicate septic peritonitis or intestinal obstruction.

Prognosis.—The prognosis depends upon the general condition of the patient and the presence or absence of complications. The condition need cause no alarm, provided serious symptoms do not intervene, if the bowels are not moved for five or six days after operation.

Treatment.—If the bowels are not moved on the evening of the second day (see p. 845, After-treatment) nothing further is attempted until the following morning, when a second ox-gall enema is given high in the bowel and 2 grains of purified ox-gall (*fel bovis purificatum*) is administered internally in pill form every hour until eight doses are taken. In the meantime the position of the patient is changed and an ice-bag placed over the epigastrium. If no results follow in the course of eight or ten hours, a high rectal enema composed of the following ingredients is given:

℞. Olive oil, ... f℥vj
Glycerin, ... f℥ij
Spirits of turpentine, ... f℥j
Sulphate of magnesia, ... ℥ij
Soapsuds and water (105° F.), ... q. s. ad Oij
M.

If the bowels have not moved by the next morning, the patient is given a full bottle of citrate of magnesia in broken doses (4 ounces every hour), followed by an ox-gall enema. If no results are obtained by the following day, croton oil may be administered as follows:

℞. Croton oil, ... ♏j
Glycerin, ... f℥j.
M. Sig.—One to two teaspoonfuls every forty minutes.

This is a very acceptable method of giving croton oil, and the bowels are usually moved after the second or third dose.

The management of these cases naturally varies at times, and other remedies may be tried when those recommended above fail to accomplish results (see chapter on constipation). The cardinal principle, however, in the treatment is not to crowd the use of remedies, as it not infrequently happens that an evacuation occurs spontaneously several hours after the last attempt has been made to secure a movement.

TYMPANY.

Excessive tympany following an abdominal or pelvic operation may be due to simple causes, such as intestinal paralysis or constipation, and to serious complications, such as septic peritonitis or obstruction of the bowels. When tympany is due to a serious complication, it is associated with a marked elevation of the temperature, rapid pulse, and vomiting, while in cases due to a simple cause the distention of the intestines is the chief and most prominent manifestation of the condition. Tympanites associated with septic peritonitis or intestinal obstruction will be considered later on and its treatment discussed in considering these complications.

The possibility of the occurrence of post-operative tympany is greatly lessened or prevented altogether by a careful course of preparative treatment and the proper management of the patient after operations. In some cases, however, excessive tympanites develops despite every precaution that is taken, and although it is seldom in itself a cause of death, yet it may produce great distress and interfere with the chances of recovery. In exceptional cases in which the abdominal distention is enormous, the pressure exerted upon the diaphragm and the heart may result in grave interference with their functions and cause a fatal ending.

Treatment.—The chief indication in the treatment is to cause a free evacuation of the bowels. This can usually be accomplished by changing the position of the patient and administering a purgative dose of citrate of magnesia, followed in three hours by an ox-gall enema.

The introduction of a tube into the rectum or the sigmoid flexure is often followed by a free escape of gas and a decrease in the amount of tympany. Great comfort is often experienced by the patient if the tube is allowed to remain in the rectum, as it permits the gas to continuously escape and thereby prevents distention.

Good results are frequently derived from the administration of 2 grains of purified ox-gall in pill form every hour until eight doses are given and the subsequent injection of a pint of milk of asafetida high in the rectum.

Applications to the surface of the abdomen above the situation of the incision often relieve the condition and assist materially in permanently curing the tympany. An ice-bag or a turpentine stupe is one of the best local applications for this purpose. If the latter means is employed, it should be properly applied, otherwise the turpentine will be unevenly distributed and act as a vesicant. A turpentine stupe should be given as follows: Thoroughly mix six ounces of olive oil

and two drachms of spirits of turpentine by shaking them together in an eight-ounce bottle. Spread the mixture gently over the abdomen with the hand and place a flannel compress wrung out of hot water over the parts. The compress should be renewed every ten or fifteen minutes and the mixture reapplied every hour.

SECONDARY HEMORRHAGE.

Symptoms.—The symptoms of secondary hemorrhage, as a rule, come on gradually and become progressively worse unless the bleeding is checked or death eventually ends the scene. The patient, as a rule, recovers from the anesthetic with a slow, full pulse, a normal temperature, and a good general condition, but in the course of a few hours a change takes place and symptoms of internal hemorrhage occur.

The pulse is quickened in frequency and diminished in volume and force; the respirations are shallow, irregular, sighing, and labored; the temperature is subnormal; the face is extremely pale and has an anxious pinched expression; the lips and the finger-nails are livid; the mucous membranes blanched; the skin is cold and clammy; the eyes are fixed and glassy and the pupils are widely dilated; the extremities are cold; the patient is usually restless and moves her head from side to side or her arms in various directions, although in some cases she may be listless or apathetic without any evidence of irregular muscular activity or tremor; nausea and vomiting are occasionally present; and the patient may complain of black specks floating before her eyes and a ringing or singing sound in her ears. Finally, all the symptoms gradually increase in severity; the mind becomes clouded; muttering delirum develops; convulsions occasionally occur; and death slowly intervenes.

Diagnosis.—Secondary hemorrhage is liable to be mistaken for shock, and the differential diagnosis must be promptly made, otherwise death almost invariably results from excessive loss of blood.

This subject will be fully considered under the Differential Diagnosis of Shock (see p. 858).

Prognosis.—The prognosis depends upon the amount of blood lost and the previous condition of the patient. If the hemorrhage comes from a fairly good-sized vessel and it is not promptly checked, death usually takes place in from ten to twenty hours. The secondary anemia which usually follows a severe hemorrhage may be very profound in character and last for several months.

Prompt operative interference combined with active treatment will save a large proportion of cases of secondary hemorrhage, provided the antiseptic precautions are carefully carried out and the operation is quickly performed.

Treatment.—The treatment consists in reopening the abdomen, tying the bleeding vessel, and using appropriate remedies to stimulate the action of the heart and replace the volume of blood lost.

Preparation of the Patient.—No preparatory treatment is required except to catheterize the bladder, and the patient is placed on the operating table as soon as possible. It is unnecessary to resterilize the abdomen, as it is protected by the dressings which were placed over the wound at the time of operation, and hence the parts are sterile. Cardiac stimulants and injections of normal salt solution must not be administered until everything is in readiness to proceed at once with the operation, as they tend to increase the hemorrhage and thus lessen the patient's chances of recovery.

Anesthesia.—A minimum amount of the anesthetic should be administered. The weakened and apathetic condition of the patient renders it unnecessary to push the anesthetic, and the operation should be started before complete unconsciousness, using as little of the drug as possible and stopping its administration at the earliest possible moment.

Instruments.—(1) Scalpel; (2) scissors; (3) two short hemostatic forceps; (4) two long hemostatic forceps; (5) two long-bladed hemostatic forceps; (6) two bullet forceps; (7) dressing forceps; (8) pedicle needle; (9) abdominal

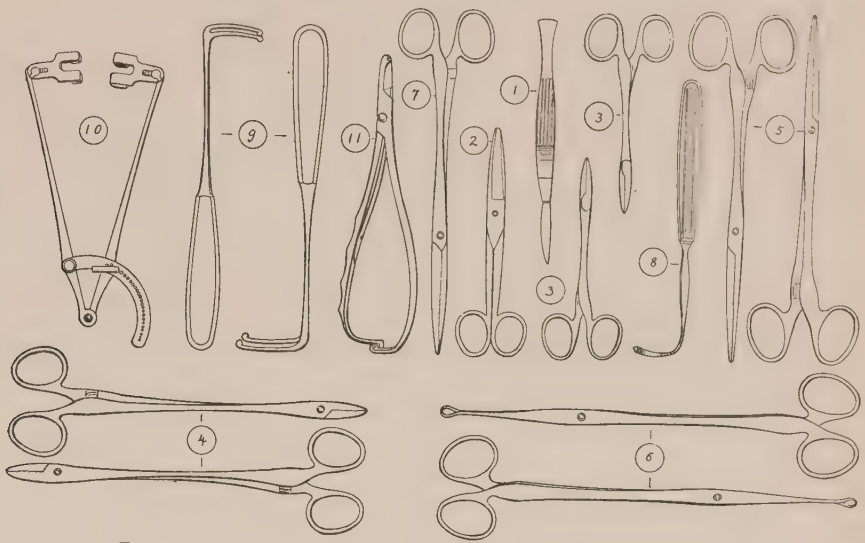


FIG. 778.—INSTRUMENTS USED IN OPERATING FOR SECONDARY HEMORRHAGE.

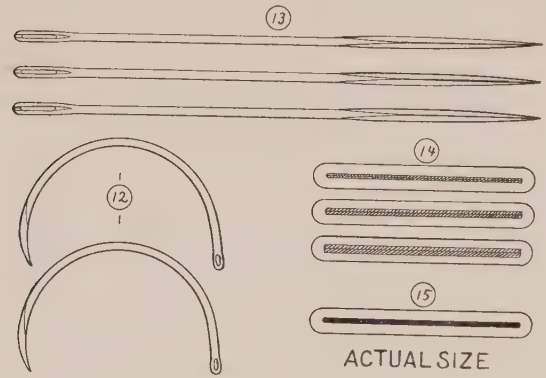


FIG. 779.—NEEDLES AND SUTURE MATERIALS USED IN OPERATING FOR SECONDARY HEMORRHAGE.

retractors; (10) Ashton's self-retaining abdominal retractors; (11) needle-holder; (12) two small full-curved Hagedorn needles; (13) three straight triangular pointed needles; (14) Nos. 2, 7, and 12 braided silk; (15) silkworm-gut—20 strands.

Dressings.—The contents of the conveyance boxes are the same as given for abdominal operations on page 839.

Cardiac Stimulants.—The following remedies should be at hand: Strychnin, nitroglycerin, atropin, and whisky.

Saline Injections.—The nurse should have three gallons of normal salt solution prepared (see p. 126) and the necessary apparatus for giving an intravenous injection (see p. 129) and enteroclysis (see p. 135.) sterilized and ready for use.

Assistants.—An anesthetizer, one assistant, and two general nurses are required.

Operation.—So soon as the patient is placed on the operating table the dressings are removed and the operator proceeds without delay to reopen the wound and search for the bleeding vessel. At the same time a hypodermic of strychnin (gr. $\frac{1}{20}$), nitroglycerin (gr. $\frac{1}{100}$), and atropin (gr. $\frac{1}{150}$) is administered, and the administration of an intravenous injection of normal salt solution is begun and continued during the operation until from one to six quarts of fluid are injected into the vein.

The operator begins by removing three sutures at the lower angle of the abdominal incision and separating the freshly united structures with his finger or the handle of a scalpel. If blood is found in the pelvic cavity, the remaining sutures are at once removed and the bleeding point located. The method of procedure after reopening the wound depends upon the nature of the original operation, and valuable time will be saved if the operator at once directs his attention to the most likely situation of the bleeding vessel.

If the operation has been a salpingo-oöphorectomy, one or two fingers should be passed directly down to the fundus of the uterus, which is then seized with bullet forceps and pulled up into the incision. The pedicles are then examined, and if the source of the hemorrhage is not discovered they are ligated again and dropped back into the pelvic cavity. If one of the ligatures has slipped, the inner and outer extremities of the broad ligament are seized with long-bladed hemostatic forceps to control the bleeding until the free blood is removed and the field of operation exposed to view. The vessels are then ligated and the stump dropped back into the pelvis.

When a secondary hemorrhage follows a hysterectomy, the method of securing the bleeding point is somewhat different, as it is impossible to bring the uterine stump into view without first removing some of the free blood and placing the patient in a marked Trendelenburg position. The stump of the uterus is then seized with bullet forceps and lifted as far as possible out of the pelvic cavity. If the bleeding point is discovered, it should be ligated at once; but if the source of the hemorrhage is not apparent, an additional ligature should be applied on each side of the uterine stump to reinforce the original ligatures and secure the open vessel or vessels.

When a hemorrhage follows an operation in which there were extensive adhesions, a careful examination must be made of the entire pelvic cavity; and if the capillary oozing is profuse, it must be controlled by packing strips of gauze around a glass drainage-tube (see p. 902) after making sure that no large vessels require ligating.

After controlling the hemorrhage the abdominal and pelvic cavities are irrigated with normal salt solution until the blood-clots are removed and the fluid comes out comparatively clear. A large amount of the solution is allowed to remain in the peritoneal cavity, and only so much is removed as can be squeezed out by gently compressing the walls of the abdomen with the hands.

The wound is closed and dressed in the usual manner.

Before the patient leaves the operating table she is given a high rectal injection of a quart of normal salt solution (*enteroclysis*, see p. 135) containing two ounces of whisky.

After-treatment.—So soon as the patient is removed from the operating table she is immediately put to bed and wrapped in a warm blanket. Hot-water bags or bottles are then placed about her body and lower extremities, the foot of the bed raised about twelve inches from the floor, and a hypodermic of $\frac{1}{20}$ of a grain of strychnin given. The further treatment of the case depends upon the promptness and degree of reaction, and no hard and fast rules can therefore be formulated to meet the requirements in every case. Usually, however, if the patient is doing fairly well and the reaction is good, $\frac{1}{20}$ of a grain of strychnin should be given hypodermically every hour until the indications point to a lessening of the dose or muscular twitchings show that the physiologic limits of the drug have been reached. The dose is then reduced to $\frac{1}{30}$ of a grain every three hours and eventually increased or decreased according to circumstances. Six hours after the operation a hypodermic of atropin (gr. $\frac{1}{150}$) and nitroglycerin (gr. $\frac{1}{100}$) is given and repeated every eight hours until three doses have been taken.

The frequency and quantity of the saline injections depend entirely upon the indications, and the condition of the pulse must always be taken into consideration in deciding the question. By the time the patient is put to bed she has received two or more quarts of normal salt solution,—one quart or more by the intravenous route and one quart by the rectum,—and unless the bleeding has been excessive no more will be required, as a rule, until six hours have elapsed since the operation. From one pint to one quart of the solution is then given by enteroclysis or by hypodermoclysis and repeated every six hours so long as indicated. In addition, the strength of the patient should be supported and the thirst relieved by giving a nutrient enema every three hours, consisting of the yolk of one egg, six drachms of whisky, two drachms of liquor pancreatis, and three ounces of beef-tea.

So soon as reaction occurs and the absorbing power of the stomach is restored small quantities of highly concentrated nourishment should be given by the mouth to sustain the patient and hasten convalescence. Nothing is better for this purpose than Valentine's meat-juice, bovinine, or liquid peptonoids, and in some cases the use of a dry champagne or a fine brandy will also prove of great value.

Special Directions.—When hypodermic injections are employed in cases of secondary hemorrhage, they must be given in the subcutaneous tissues of the chest or abdomen, and not in the extremities, where the circulation is very weak and the remedy will not be absorbed.

In cases of severe hemorrhage the upper and lower extremities should be firmly bandaged to force out the blood and keep it in the head and body.

The amount of stimulation and the frequency and quantity of the saline injections, as well as the best route to employ in introducing them into the circulation, depend entirely upon the indications and the ability of the surgeon to interpret them correctly. Thus it may be found that larger and more frequent doses of strychnin, nitroglycerin, or atropin are required to combat heart failure and sustain the sinking forces. And, finally, it may be necessary to repeat the intravenous injection of normal salt solution in the other arm or administer the solution more frequently by the subcutaneous or rectal route.

SHOCK.

Symptoms.—The symptoms of shock come on suddenly, as a rule, shortly after an operation, and are characterized by profound depression of all the vital centers.

The patient does not usually recover from the anesthetic in a satisfactory condition, the pulse is slightly accelerated and somewhat weaker than it should

be, and her general condition indicates that she is not doing well. The actual onset of the attack is sudden and the symptoms manifest themselves quickly. The pulse is very rapid, weak, and easily compressed; the respirations are hurried and irregular or they may be so shallow as to be hardly discernible; the temperature is lowered one or two degrees; the face is pallid and pinched and the features may be greatly distorted; the lips and finger-nails are of a bluish hue; the hands and fingers have a shriveled appearance; the mucous surfaces are pale; the skin is blanched and covered with a profuse, cold, clammy perspiration; the sphincter muscles are sometimes relaxed; the extremities are cold and the patient lies upon her back in a listless semiconscious state with half-closed eyelids. Vomiting may occur in some cases, and in others delirium may intervene, assuming either a mild low type or becoming maniacal in character.

If the attack tends toward a fatal issue, all the symptoms become more marked and the patient gradually passes into a state of stupor ending in death. If, however, reaction takes place, a slow improvement is noted and the vital forces finally begin to assert themselves, as shown by the condition of the circulation, the respiration, the temperature, and the mental attitude of the patient.

Diagnosis.—It is always necessary to distinguish shock from secondary hemorrhage, as the symptoms of the two affections are very similar, and a mistake in the diagnosis would naturally have a most unfavorable result.

The following points of difference must be taken into consideration in making the diagnosis:

Shock.	Hemorrhage.
1. Generally follows a prolonged operation or one in which the abdominal viscera have been exposed to the air or more or less roughly handled; it is also likely to occur in women who are weak and exhausted physically.	1. May follow either a severe or a simple operation; the general condition of the patient does not influence its occurrence.
2. The patient is listless and apathetic and there is seldom any tendency to toss about in the bed.	2. The patient is restless and her mind apprehensive and anxious.
3. Seldom recurrent attacks of syncope.	3. Recurrent attacks of syncope frequent.
4. Pulse and general condition not satisfactory immediately after operation and the symptoms of collapse come on suddenly.	4. The patient recovers from the anesthetic in a good condition, but later on the pulse gradually becomes accelerated, the temperature falls below normal, and collapse finally intervenes.
5. General stimulating treatment tends to improve the pulse.	5. The pulse progressively grows worse despite all that is done to stimulate the heart and secure reaction.
6. The blood findings are negative.	6. There is a moderate leukocytosis (15,000 to 25,000); the number of red cells and the percentage of hemoglobin are diminished (Martin and Hare); the blood-plaques are increased in number; and the coagulation time of the blood is more rapid.

Prognosis.—The time when reaction sets in depends upon the severity of the symptoms and the condition of the patient prior to operation. In favorable cases reaction usually occurs within a few hours; if it is delayed from twelve to twenty-four hours, the prognosis is bad. Delirium is a very grave omen, and if vomiting occurs after the patient has been in shock for several hours the chances of recovery are not good. A continuous subnormal temperature for several hours, as well as a very rapid pulse, is an unfavorable sign; and if *delirious shock* intervenes, accompanied by a high fever (102° to 103.5° F.) the condition of the patient is exceedingly grave.

Treatment.—The patient is wrapped in warm blankets, hot-water bags are placed around her body and lower extremities, and a mustard leaf is applied over the region of the heart. The foot of the bed is raised twelve inches from the floor and the patient's head is placed directly upon the mattress. She is then given a hypodermic of strychnin (gr. $\frac{1}{30}$), nitroglycerin (gr. $\frac{1}{100}$), and atropin (gr. $\frac{1}{150}$), and immediately afterward normal salt solution is injected into one of the veins of the forearm (see Intravenous Injections, p. 129).

One-twentieth of a grain of strychnin is then given every half-hour until the symptoms improve or muscular twitchings occur, when the frequency and strength of the dose are reduced to meet the indications. The nitroglycerin and atropin are repeated every two or three hours if required, and a stimulating rectal enema is administered every three or four hours consisting of a pint of hot coffee or beef-tea, to which is added two or three ounces of whisky.

No food is given by the mouth until reaction sets in and the absorbing power of the stomach is restored, when highly concentrated nourishment and brandy are cautiously administered in small doses (see Treatment of Hemorrhage, p. 857). Hypodermics must always be administered in the subcutaneous tissues of the chest and the abdomen, and not in the arms or the legs, as the circulation in the extremities is almost entirely suspended. As in the case of secondary hemorrhage, the amount of stimulation and the frequency and quantity of the saline injections depend upon the indications and the ability of the surgeon to read them correctly. It may be necessary to repeat the salines every six or eight hours or oftener, and they should be given either by the intravenous or subcutaneous route.

Crile's Observations upon Shock.—The following conclusions of Crile are quoted from "An American Text-Book of Surgery":

"*Surgical shock* is a state of low blood-pressure due to functional impairment or exhaustion of the vasomotor center. This impairment or exhaustion is due to traumatism (operation or injury) of sensitive tissue.

"*Collapse* is a state of low blood-pressure due to a suspension of the function of the heart or of the vasomotor center, or to hemorrhage. Among the causes of collapse may be mentioned injury of the heart; inhibition of the heart, reflexly through the superior laryngeal or directly through injury of the vagus or vagus center; injury of the vasomotor center, etc.

"*The differential diagnosis* between shock and collapse is very largely dependent upon the history of the case. The symptoms in both are practically identical. Even in the cases of collapse due to hemorrhage the differential diagnosis without the history and without the direct evidence of hemorrhage is almost impossible.

"The *symptoms* of shock and collapse are incident to a low blood-pressure, and indicated by a feeble pulse, muscular relaxation, mental impairment, pallor, clammy skin, etc.

"The *treatment* of shock falls under the following heads: (*a*) Secure physiological rest. This demands both mental and physical repose. If there is excessive pain, morphine should be given. The wound should be kept as free as possible from irritation. (*b*) Meanwhile the blood-pressure of the brain should be supported by elevating the foot of the bed, by pressure upon the extremities, by bandaging, or by applying a pneumatic rubber suit, by which a uniform pressure may be applied upon the extremities and the abdomen. The blood-pressure by this means may be raised 25 to 65 mm. of mercury.

"Normal saline infusion has a certain range of usefulness, especially when there has been hemorrhage. The vasomotor center being exhausted, vasomotor stimulants, such as strychnin, are contraindicated, since this would 'lash the

tired horse.' In severe cases adrenalin chloride (1: 25,000 of normal salt solution) in moderate dosage—*i.e.*, 2 to 5 c.c. per minute—may be given.

"In collapse the indication is for tiding the circulation over a crisis. This may be done by stimulants, such as strychnine, digitalis, etc.; by mechanical support, as in shock; by saline infusion; by adrenalin chloride; by divulsing the sphincter ani in certain cases."

ASEPTIC OR FERMENTATION FEVER.

Definition.—This is a form of fever which occurs after an aseptic operation, and is due to absorption of fibrin-ferment derived from the tissues at the seat of operation or in the abdominal wound. The elevation of temperature in this common variety of surgical fever is spoken of as the "*post-operative rise.*"

Symptoms.—Fever is the chief symptom. It usually appears within six or eight hours after operation and continues from one to two or three days. The temperature ranges between 99.5° and 102° F., and generally reaches its highest elevation about thirty-six hours after operation.

The pulse is but slightly, if at all, affected; the general condition and expression of the patient are good; and there is an absence of any subjective or objective symptoms that would give rise to anxiety.

Diagnosis.—The diagnosis is based upon the early appearance and moderate degree of fever; the character of the pulse; the general condition and expression of the patient; the absence of grave symptoms; and the aseptic nature of the operation. If, however, the patient was septic at the time of operation, or the peritoneum was contaminated by the contents of an infected sac, it would be very difficult for the first twenty-four hours to distinguish between septicemia and aseptic fever, unless the pulse becomes decidedly accelerated and the general condition indicates the onset of a grave complication.

Prognosis.—The prognosis is good, and recovery invariably takes place unless septic infection subsequently develops.

Treatment.—There are no indications for treatment.

TRAUMATIC PERITONITIS.

Description.—This form of peritonitis, which is also spoken of as plastic, is a purely regenerative process, produced by aseptic causes, and therefore not to be classed with true inflammations of the peritoneum. The febrile reaction which is associated with this form of peritonitis is due to the absorption of fibrin-ferment and the products of metabolic tissue-changes into the circulation, and not to the presence of infection. The plastic lymph which is thrown out around the area of irritation soon becomes organized and adhesions occur between opposing surfaces which may lead to serious kinking of the intestines. The adhesions may become permanent or they may eventually be absorbed and leave no trace of their previous existence. The extent and severity of the peritonitis depend upon the nature of the operation and the amount of exposure or rough handling to which the intestines were subjected.

Symptoms.—The symptoms usually appear within six or eight hours after operation, and their severity depends upon the extent of the peritonitis.

In *moderate cases* the pulse is but slightly accelerated and the temperature does not go beyond 100.5° F. There is localized pain, tenderness, and rigidity of the abdomen, and the stomach may be somewhat unsettled. Tympany, as a rule, is absent or but slight in amount, and the general condition of the patient

is good. The symptoms begin to disappear after the second or third day and convalescence is rapidly established.

In *severe cases* the symptoms are more marked, and in some respects they closely resemble those caused by septic infection of the peritoneum. The pulse, as a rule, is but slightly accelerated, and its volume is full and strong; the temperature ranges between 99° and 102° F.; tympanites is more or less marked, and in some cases the distention of the intestines may be so great as to seriously interfere with respiration; the stomach is unsettled and there is nausea and vomiting; the patient complains of severe and agonizing intermittent colic like pains in the lower abdomen; the abdominal wall is tender and rigid; and the bowels are usually constipated. The general condition and expression of the patient are fairly good and bear no relation to the severity of the symptoms. If, however, the symptoms are aggravated and continue for several days, the patient usually becomes exhausted and her general condition bad. The general and local symptoms begin to improve in the course of three or four days, although they may continue for a longer period and give rise to great anxiety before convalescence is fully established.

Diagnosis.—The affection must be distinguished from general septic peritonitis. In mild cases the diagnosis is based upon the aseptic character of the operation; the slow and full pulse; the general condition and appearance of the patient; and the absence of grave symptoms.

In aggravated cases it is often difficult or impossible to make a differential diagnosis until the final outcome of the case has been reached and convalescence is established or death occurs. This is especially true when the symptoms are very severe and long-continued and the patient becomes exhausted. Under these circumstances the pulse becomes rapid and weak and the facial expression of the patient assumes the pinched or anxious appearance so characteristic of septic infection. These are the cases in which a mistaken diagnosis is made, and if death does not take place they are reported as recoveries from general septic peritonitis.

The differential diagnosis between an aggravated form of traumatic peritonitis and septic infection of the peritoneum is based upon the aseptic nature of the operation; the character of the pulse compared with the severity of the local and general symptoms; the absence, as a rule, of the pinched or anxious facial expression of sepsis; and the strength of the patient. Nausea and vomiting are not usually severe in cases of traumatic peritonitis and the distressing retching which accompanies sepsis is not often present.

Prognosis.—Recovery usually takes place even in aggravated forms of the affection except when serious complications intervene. In some cases the exuded serum may become infected and sepsis develop; obstruction of the bowels may occur from adhesions kinking the intestine or a band of inflammatory lymph occluding its lumen; and, finally, serious or grave symptoms may result from an excessive tympanites interfering with respiration.

Traumatic peritonitis, as a rule, remains limited to the irritated or injured areas, and it shows but little or no tendency to become general.

Treatment.—The indications are to restore peristalsis and induce free purgation.

In *mild cases* in which the stomach is quiet a turpentine stupe (p. 854) is applied to the abdomen and the patient given a full bottle of citrate of magnesia in broken doses (4 ounces every hour), followed by an ox-gall enema (p. 105). This treatment, as a rule, not only causes free purgation and the disappearance

of the tympanites, but it also promptly removes the serous fluid that has been exuded into the peritoneal cavity. No food is given by the mouth until the bowels have moved, and if the condition of the patient in the meantime requires stimulation or nourishment, it should be administered by the rectum. The food which is subsequently given by the stomach should be highly concentrated, administered in small amounts, and frequently repeated (from 1 to 4 teaspoonfuls every thirty minutes or every one or two hours). Albumen-water, beef-juice, liquid peptonoids, Valentine's meat-juice, and other forms of liquid diet described on page 106 are nutritious and easily assimilated by the stomach, and should be selected in these cases.

In *aggravated forms* of the affection it is often difficult to relieve the symptoms, as the stomach is irritable and unable to retain anything; the tympanites is excessive; and the patient is weakened and exhausted by her suffering. A turpentine stupe, a hot-water bag, or an ice-bag is first applied to the abdomen, and a rectal enema given consisting of olive oil, f℥vj; glycerin, f℥ij; spirits of turpentine, f℥j; sulphate of magnesia, ℥ij; and warm soapsuds and water, q. s. ad Oij. The injection is repeated every two hours until the bowels are evacuated and the gas is expelled. If, however, no results follow after the third enema has been given, and the nausea and vomiting continue to be severe or are accompanied by the regurgitation of a dark, foul-smelling fluid, we must resort at once to lavage of the stomach. After thoroughly washing out the stomach with normal salt solution an ounce of Epsom salt, combined with half an ounce of whisky and three ounces of beef-tea, is introduced and the tube withdrawn. Two hours after the lavage an ox-gall enema is given to assist the salt in inducing free purgation and expel the flatus. If the vomiting returns, the stomach should be washed out every three or four hours until it ceases, and each time lavage is employed beef-tea and whisky should be introduced through the tube before it is withdrawn. As soon as the bowels are freely moved the patient is given a dry champagne or a fine brandy and placed upon a highly concentrated liquid diet. If the nausea still continues, feeding by the mouth must be stopped and nutrient enemata given every four to six hours. The heart and nervous system should be sustained by administering strychnin hypodermically in doses of $\frac{1}{30}$ to $\frac{1}{20}$ of a grain every one or two hours.

The foregoing treatment will usually be followed by recovery, but if the symptoms are caused by septic peritonitis, no relief can be expected, and the patient eventually succumbs to the disease.

GENERAL SEPTIC PERITONITIS.

Symptoms.—The symptoms of septic peritonitis manifest themselves, as a rule, in from twenty-four to forty-eight hours after operation, and in the meantime the general condition of the patient is fairly good, although in some cases recovery from the anesthetic may not be entirely satisfactory or normal. The first indications that the patient is not doing well are shown by an increase in the rate and volume of the pulse and a slight elevation of the temperature. The stomach then becomes unsettled or the ether vomiting may be prolonged until the gastric irritability due to the infection manifests itself, and the patient complains of sharp intermittent pains in the lower abdomen. In the course of a few hours intestinal paralysis intervenes and tympanites develops. The symptoms gradually, almost imperceptibly, grow worse and worse, and death from collapse usually takes place at the end of the fourth or fifth day after operation, although it may be delayed for a week or even longer if the patient's power of resistance is strong and the virulence of the infection is moderate.

The pulse in the beginning ranges between 85 and 100 beats to the minute, and later on gradually rises to 120, 140, 160, or more. It is small, tense, and wiry at first, and lacks the soft, full volume which is characteristic of aseptic fever or traumatic peritonitis. As the disease advances, however, it becomes weaker, then thready, and finally almost imperceptible.

Vomiting is not persistent at first, and usually begins by the stomach ejecting its contents. It then becomes bilious in character, and finally a dark, foul-smelling fluid is vomited which becomes fecal if reversed peristalsis takes place. As the disease progresses the vomiting becomes very frequent and the patient suffers from constant retching, which causes intense suffering, especially in the lower abdomen.

The temperature in the beginning is usually not high and ranges between 100° and 101° or 102° F., but as the infection advances it becomes more elevated and may reach 105° F ; and in some cases it may rise to 106° or 107° F. immediately before death. In occasional instances the onset of the disease may be marked by a distinct chill followed by a sharp rise in the temperature (103° to 105° F.), although, as a rule, there is no rigor and the patient only complains of a chilly sensation. The rise in temperature is not a constant factor in septic peritonitis, and in some cases it is insignificant compared with the gravity of the case, while in others a normal or even a subnormal temperature may be present.

The sharp intermittent abdominal pains which begin early in the course of the disease gradually become more frequent and severe, and are aggravated by the violent abdominal contractions which accompany the excessive vomiting and retching. The tympanites gradually increases, and finally the abdomen becomes greatly distended and the respirations are impeded on account of pressure upon the diaphragm. The bowels are obstinately constipated and do not respond to treatment. The patient becomes restless and tosses about in bed. Her expression becomes anxious, drawn, and pinched, the mind becomes clouded, muttering delirium is frequent, and the eyes are sunken. The skin assumes an ashen hue and the surface of the body is covered with a cold, clammy sweat.

There is another form of septic peritonitis which is fulminant in character and destroys life within twenty-four or forty-eight hours after operation. In these cases the patient is overwhelmed by the virulency of the infection and the local symptoms are generally absent. The disease usually begins within a few hours after the operation and is characterized by great depression or collapse. The pulse suddenly becomes rapid (120 to 160 or more), then irregular and weak, and finally disappears altogether. The temperature, as a rule, ranges between 99.5° and 101° F., or it may reach as high as 105°, and in some cases it may be subnormal. The expression of the patient is anxious and pinched; the mind is usually clouded; and the surface of the body is covered with a cold perspiration. Tympanites and other local symptoms of peritonitis may or may not develop, according to the virulency of the infection and the rapidity with which death occurs.

Diagnosis.—The character of the operation and the thoroughness of the antiseptic precautions are often important points to consider in deciding the question of diagnosis. It is practically impossible at the outset of the disease to make a diagnosis and to say with any degree of certainty whether or not the case is one of septic peritonitis. In the course of twenty-four to forty-eight hours, however, the disease can usually be recognized, although it must be remembered that aggravated forms of traumatic peritonitis may so closely resemble the septic variety as to render such a diagnosis out of the question. Generally speaking, when a patient begins to do badly on or about the second day and has a gradually

rising pulse, associated with fever, vomiting, colicky pains in the abdomen, and tympanites, the indications are strongly in favor of septic peritonitis, and this suspicion becomes almost a certainty as the symptoms increase in severity and the face assumes the characteristic expression of the disease.

Fulminant forms of septic peritonitis must be distinguished at times from shock and internal hemorrhage.

A consideration of the blood-findings in cases of peritonitis and septic infection will be found in Chapter III.

Prognosis.—Death invariably results in general septic peritonitis, and the reported instances of supposed recovery from the disease are in reality cases of mistaken diagnosis in which the symptoms were due to a localized infection or an aggravated form of traumatic peritonitis. Owing, therefore, to the impossibility of making a positive diagnosis in many instances, and the fact that patients sometimes recover after all hope is practically abandoned, we should give the patient the benefit of the doubt and treat the case as if it was not necessarily fatal.

Treatment.—From the standpoint of treatment the disease should be looked upon at the beginning as a case of traumatic peritonitis, and managed accordingly (see Treatment of Traumatic Peritonitis, p. 861). When a fatal issue is no longer in doubt, active measures should be discontinued and morphin given hypodermically in sufficient quantities to relieve the patient's suffering.

Operative interference is seldom, if ever, indicated. In the early stages of the disease the diagnosis is too uncertain to warrant the risks of a secondary operation, even granting, for the sake of argument, that it would do good at that time; and later on, when the symptoms have become characteristic, nothing will be accomplished by surgical interference except to hasten the patient's death.

Saline injections are indicated as a routine practice in cases of septic peritonitis, especially when the pulse begins to fail and the kidneys become sluggish. In addition to stimulating these organs, the injections do good by diluting the poison circulating in the blood and acting as a tonic to the nervous system.

LOCALIZED INFECTION.

General sepsis may be due at times to the introduction into the circulation of septic micro-organisms or their products from a localized or circumscribed area of infection.

The disease may arise from an infected pedicle or ligature; from a single or multiple abscesses within the pelvic or abdominal cavity; and from suppuration in the wound.

Symptoms.—The symptoms do not manifest themselves, as a rule, for three or four days or longer after operation, and in the meantime the patient's general condition is fairly good. The onset of the disease is marked by a gradual rise in the pulse-rate, which ranges between 100 and 120 beats to the minute, and chilly sensations associated with dull muscular pains. The temperature varies. As a rule, it is not high, and seldom goes beyond 102° or 103° F. It is usually lower in the morning than in the evening, and it may even occasionally drop to normal for several hours at a time during the course of the disease. The pulse does not become weak and lose its volume, as in septic peritonitis, and it does not often go beyond 120, except in very grave cases of infection. The patient's mind usually becomes more or less clouded; the appetite is poor; the stomach is somewhat unsettled; slight tympanites associated with localized abdominal or pelvic

pain is usually present; and the skin is covered with a clammy sweat. The bowels, as a rule, are difficult to keep regular, but in some cases the opposite condition exists, and diarrhea may develop and add to the patient's discomfort.

The disease usually runs a slow course and there is little or no tendency to a sudden collapse. If recovery is likely to take place, the symptoms gradually subside and the patient becomes convalescent. On the other hand, if the symptoms become grave an exhausting diarrhea sets in; repeated rigors occur; and the temperature becomes high. The pulse loses its volume and becomes rapid and weak; the tongue is dry and cracked; the stomach is very irritable; and the kidneys are sluggish. The patient complains of great exhaustion, and death is ushered in by delirium and stupor followed by coma.

Pyemia may develop during the course of the disease.

Diagnosis.—The disease must be distinguished from traumatic and general septic peritonitis.

In cases of general sepsis due to a localized focus of infection the symptoms do not usually appear for several days after operation; the pulse, as a rule, is not very rapid nor weak; the temperature is generally low; the condition of the patient is fairly good and there are no indications of a sudden collapse; the face is not pinched or drawn, as in septic peritonitis; and the course of the disease is slow.

An examination may reveal a localized swelling in the pelvis or in the line of the abdominal incision.

A consideration of the blood-findings will be found in Chapter III.

Prognosis.—The disease, as a rule, is amenable to treatment unless the infection is very virulent or it is impossible to remove the source of septic contamination. In some cases the area of infection may become surrounded by a thick wall of inflammatory exudate and the absorption of septic material into the circulation is arrested; the patient then usually recovers from the acute condition with a chronic abscess remaining in the pelvis.

Treatment.—The treatment consists in (*a*) removing the focus of infection; (*b*) sustaining the strength of the patient; and (*c*) assisting the system to eliminate the poison.

Removing the Focus of Infection.—So soon as the symptoms manifest themselves and the surgeon suspects that the patient is septic, he should at once endeavor to locate the focus of infection. The abdominal wound is first examined to determine whether it has become infected and is the seat of an abscess or a beginning suppuration. If there is no evidence of inflammation upon inspection, and palpation fails to reveal any hardened areas in the neighborhood of the incision, it may be taken for granted that the point of contamination is situated elsewhere. The pelvic cavity is then carefully examined by vaginal, rectal, and vagino-abdominal palpation in order to thoroughly investigate all parts of the pelvis. If no suspicious enlargement or swelling is found, nothing can be done beyond watching the patient carefully and repeating the examination from time to time with the expectation that a localized area of infection may eventually be discovered.

In the meantime, however, if the symptoms become alarming and the patient is evidently going from bad to worse, the abdomen should be reopened and a careful search made for the point of infection. If an abscess cavity is found, it should be thoroughly cleansed (*not irrigated*) with a gauze sponge saturated with normal salt solution and drained with a glass tube. In some cases it may be necessary to pack a strip of gauze around the drainage-tube in order to protect the general cavity and prevent the infection from spreading.

If a localized area of infection is felt in the pelvis, it should be reached through

the vagina, thoroughly irrigated with normal salt solution, and a rubber T-drain inserted. The abscess cavity is then irrigated once or twice daily through the drainage-tube with hydrogen peroxid and normal salt solution until it is more or less completely obliterated by granulation tissue. The most frequent situation in which a purulent collection forms after an abdominal section is in the culdesac of Douglas behind the uterus, and this locality should therefore always be most thoroughly palpated in all cases where pus is suspected in the pelvis. In rare cases the uterine stump may become infected after an incomplete hysterectomy and pus may accumulate beneath the peritoneal flap. This condition can usually be detected by vagino-abdominal palpation and free drainage established by forcibly dilating the cervical canal. The infected cavity should then be irrigated once or twice a day with hydrogen peroxid, and if necessary packed with a strip of iodoform gauze.

If symptoms of septicemia develop in a case in which gauze drainage has been employed, either through a vaginal or an abdominal incision, the packing

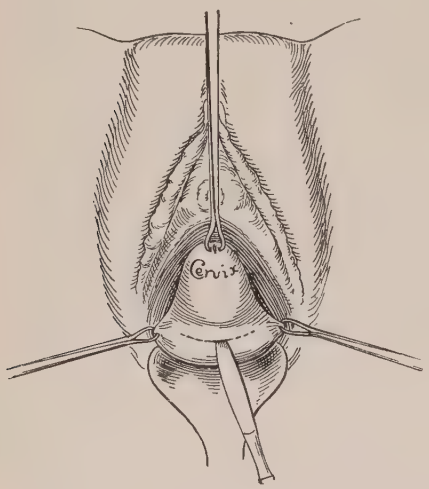


Fig. 780.

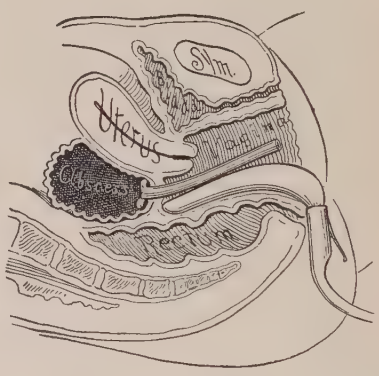


Fig. 781.

Removing a Collection of Pus from the Culdesac of Douglas.

Fig. 780 shows an incision being made through the vagina into the culdesac of Douglas; Fig. 781 shows a rubber T-drain in position.

should be removed at once, as the probabilities are that the secretions have become blocked and cannot escape. A rubber drainage-tube is then inserted into the cavity which was occupied by the gauze and the parts irrigated daily with normal salt solution.

Sustaining the Strength of the Patient.—Highly concentrated forms of liquid food are indicated, and should be given frequently in small amounts. Strychnin should be administered hypodermically in doses of $\frac{1}{20}$ to $\frac{1}{30}$ of a grain every three hours, and a sufficient quantity of whisky given every twenty-four hours to sustain the action of the heart. If the stomach is irritable and does not retain food, stimulating nutrient enemata must be resorted to.

Assisting the System to Eliminate the Poison.—This is accomplished by keeping the bowels freely opened and employing saline injections.

A purgative dose of citrate of magnesia followed by a simple laxative enema should be given every two or three days, and in the meantime the bowels are

kept opened by a daily enema consisting of sulphate of magnesia, ℥ij; glycerin, f℥ij; spirits of turpentine, f℥j; and hot water (110° F.), Oj.

Saline injections should be given as a routine procedure, but the quantity and frequency should depend upon the strength of the pulse and the amount of urine excreted. They should be given by the intravenous, subcutaneous, or rectal route.

INTESTINAL OBSTRUCTION.

Causes.—The causes of post-operative intestinal obstruction are classified as follows:

1. Adhesions between the intestine and raw surfaces.
   - (*a*) To an omental stump
   - (*b*) To denudations of the pelvic and parietal peritoneum.
   - (*c*) To the edges of the vaginal wound following abdominal or vaginal hysterectomy.
   - (*d*) To a pedicle.
   - (*e*) To surfaces on the intestinal wall.
2. Paralysis of the intestine.
3. Local spasm of the intestine.
4. Impacted feces.
5. Bands of inflammatory lymph.
6. Adhesions between coils of intestine or between the gut and neighboring parts, due to traumatic peritonitis.
7. Kinking or twisting of the intestine due to a faulty operative technic.
8. Including the intestine within the loop of a suture or between the edges of the incision when closing the abdominal wound.
9. Slipping of a coil of intestine through a slit or an aperture.

Adhesions between the Intestine and Raw Surfaces.—By far the greater number of bowel obstructions are due to this cause. A knuckle of gut becomes attached by adhesive inflammation to a denuded surface, a kink results, and obstruction of the bowel follows. Naturally the question will be asked: How do we explain the fact that comparatively few cases of obstruction occur from this cause when there are so many severe operations requiring the separation of extensive adhesions? The answer is that kinking does not necessarily follow the fixation of a knuckle of intestine, unless the gut adheres in an abnormal position; and, furthermore, I believe that many of the cases that end fatally after an abdominal or pelvic operation, in which death is ascribed to peritonitis, are in reality due to bowel obstruction.

Paralysis and Local Spasm of the Intestine and Impacted Feces.—As the pathology of all these causes of obstruction is the same, I shall discuss them under one heading. The correct explanation of obstructions due to local spasm or paresis of the bowel will, most probably, be found in a study of the influence of various stimuli upon the nerves controlling intestinal peristalsis. The intestinal wall contains an automatic motor apparatus—*the plexus of Auerbach*—which influences the peristaltic action of the bowel. "If this center is not affected by a stimulus, the movements of the intestines cease—comparable to the condition of the medulla oblongata in apnea. The same is true just as in the case of respiration during intrauterine life, in consequence of the fetal blood being well supplied with O. This condition may be termed *aperistalsis*. It also occurs during sleep, perhaps on account of the greater amount of O in the blood during that state. All stimuli applied to the myenteric plexus increase the peristalsis, which may become so violent as to cause evacuation of the large gut, and may even produce spasmodic contraction of the musculature

of the intestine. This condition may be termed *dysperistalsis*—corresponding to dyspnea. The condition of the blood flowing through the intestinal vessels has a most important effect upon peristaltic movements. The continued application of strong stimuli causes dysperistalsis to give place to rest, owing to overstimulation, which may be called intestinal *paresis* or *exhaustion*."

During the first twenty-four or forty-eight hours after an abdominal section, if the case is doing well, the intestines are in a condition of dysperistalsis. There are several factors concerned in bringing about this state. In the first place, the preparatory treatment of the bowels with salines, the liquid diet, and the absence of food after operation leave the intestines comparatively empty, thus removing the intestinal contents as a factor in stimulating peristalsis. Again, the rest in bed for several days before operation and the enforced quiet afterward add largely to the absence of intestinal activity. The causes of operative stimulation of the intestines are exposure to the air, lowering of the temperature, operative procedures, irritating fluids, septic matter, and neglect to thoroughly empty the bowels prior to operation. We have found that dysperistalsis and paresis depend upon the same cause, namely, an irritation of the motor center of the intestine; but that the intensity and duration of the abnormal stimulation alone determine the difference between the two conditions. For example, simple intestinal congestion would most probably, even if long continued, result in a condition of dysperistalsis, while a severe inflammation, on the other hand, would cause paresis.

Bands of Inflammatory Lymph.—As the result of intraperitoneal inflammation following abdominal and pelvic operations, lymph is poured out upon the intestine, and coils of gut become more or less adherent to each other. As a rule, no bad results ensue, but if the adhesions destroy the normal relation existing between the coils or a knuckle of gut is constricted by a band of lymph, then kinking or strangulation follows.

Adhesions between Coils of Intestine or between the Gut and Neighboring Parts due to Traumatic Inflammation.—These adhesions result from an irritation of the serous membrane which is caused by exposure of the intestine to the air, to lowering of the temperature, to handling or manipulations, and to operative procedures. Adhesions of this class are, in my experience, a necessary sequence of all intraperitoneal operations. Fortunately, traumatic adhesions are, as a rule, not followed by fatal results, as they do not necessarily cause kinking or twisting of the gut. They not infrequently, however, cause more or less remote trouble by giving rise to colicky pains and a tendency to constipation.

Kinking or Twisting of the Intestine Due to a Faulty Operative Technic.—These obstructions are not the result of adhesions, but occur after anastomotic operations upon the alimentary canal or after the repair of bowel lesions. For example, a coil of intestine may be kinked or twisted by suturing it in an incorrect position when an anastomosis is made, or, again, the bowel may be torn transversely while separating adhesions and a fatal obstruction from kinking may result from closing the opening. Longitudinal tears, even if extensive, may be safely closed with sutures, but a large transverse wound is very likely to cause a kink if it is repaired in the usual manner.

Including the Intestine within the Loop of a Suture or between the Edges of the Incision when Closing the Abdominal Wound.—At first sight these causes of bowel obstruction may appear to the surgeon as being extremely unlikely, or at least very rare; yet cases have been reported in which the accident has occurred and death resulted from obstruction, as shown by autopsies.

Slipping of a Coil of Intestine through a Slit or an Aperture.—This accident may occur from the following causes:

1. As the result of adhesions. For example, a band of inflammatory lymph may be so attached that an aperture is formed; or, again, a coil of the intestine or the mesentery may adhere and form a loop through which a knuckle of gut may slip.

2. From defects in the method of dealing with tears or incisions through the mesentery. Thus, if the mesentery is torn during the separation of adhesions and the tear is not closed, or the mesenteric flaps are not sutured after a resection of the bowel, a coil of intestine is liable to slip into the opening and become nipped.

3. Slipping of a coil of intestine through the vaginal wound after complete removal of the uterus.

4. A knuckle of gut pushing its way through the intestinal loop formed in establishing a lateral anastomosis, without resection.

5. From fixation of the gall-bladder to the abdominal incision.

6. From openings made through the transverse mesocolon and the great omentum to facilitate the attachment of the bowel to the stomach in performing gastro-enterostomy.

Symptoms.—In the majority of cases the symptoms begin to manifest themselves between the second day and the end of the first week, although they may appear earlier or be delayed for several weeks or months or even years. This variation in the date of the onset of the symptoms is readily understood when we take into consideration the causes of post-operative obstructions. Thus, for example, a sharp kink or twist in the intestine may occur suddenly and the symptoms of obstruction will naturally manifest themselves almost from the start. On the other hand, however, the constriction of the bowel may be very slight at first and the obstruction slow in forming. An obstruction caused by a band of inflammatory lymph is late in developing, as a rule, for the reason that the bowel is not seriously constricted until the exudate begins to organize and contract. It is evident, therefore, that the rapidity with which an obstruction occurs depends entirely upon the cause and character of the constriction.

The most prominent symptoms of intestinal obstruction are: (1) vomiting, (2) tympany, (3) pain, (4) elevation of the temperature, (5) rapid pulse, (6) constipation, and (7) a discharge of mucus from the rectum.

Vomiting is not only a constant and early sign of obstruction, but it is also, as a rule, persistent, and in about one-third of the cases it becomes fecal in character. *Tympanites* is almost always present to a greater or lesser extent, and it may appear in some cases before vomiting occurs; or, again, it may show itself as a later symptom. Like vomiting, tympany is usually continuous, becoming more and more marked as the case develops. The extent of the abdominal distention depends largely upon whether the obstruction is complete or not, and the time of its onset is directly influenced by the state of the alimentary canal at the moment of operation. In some cases the distended coils of intestine can be seen through the belly wall. It is interesting to note that tympany may be absent in cases of obstruction on account of extensive adhesions between the intestines and the abdominal walls. Excessive *pain* and *tenderness* may not be marked in post-operative obstruction, although, as a rule, the patient suffers acutely from severe paroxysms of colic.

The *temperature* at the start is slightly elevated, and ranges between 99.5° and 100° or 101° F. As the disease progresses, however, and collapse intervenes it becomes subnormal and the facial expression of the patient becomes Hippo-

cratic. A rapid *pulse* is one of the earliest and most constant symptoms of post-operative obstruction. It ranges between 100 and 140 beats to the minute and is very weak and feeble. *Constipation* is a prominent symptom, although at times it may be more or less misleading as a manifestation of obstruction. The passing of scybalous masses per rectum must not mislead the surgeon into the belief that the bowels have acted, and, again, there may be several free movements before symptoms of obstruction intervene. Finally, there may be obstinate constipation at the start, which is followed in a few days by several loose movements before the obstruction becomes permanent. The various degrees of kinking and constriction of the intestine account for this want of uniformity in the action of the bowels. A *discharge of mucus* by the rectum is a valuable sign in certain cases of obstruction. I have observed this symptom in three cases, and in all of them the obstruction was complete and appeared late (twelfth, twentieth, and twenty-third days). The mucus discharged by these patients was perfectly clear, and resembled closely the white of an egg. The discharge was always preceded by severe pain and bearing-down efforts. The quantity of mucus varied from one drachm to one ounce each time it was expelled.

If the obstruction is not relieved, the symptoms become more and more marked, the patient gradually becomes exhausted, and finally dies in a state of collapse.

Diagnosis.—Post-operative intestinal obstruction should be distinguished from traumatic and septic peritonitis. It is impossible, in my judgment, to make a differential diagnosis with any degree of certainty if the obstruction occurs within the first week after operation, except in very rare instances, and even in these exceptional cases any opinion expressed as to the probable lesion would be pure conjecture. Furthermore, traumatic peritonitis may be present from the start or develop within a few hours after operation, and in the course of two or three days an obstruction may gradually occur from a kink or twist which would present symptoms that could not be distinguished clinically from those dependent upon an aggravated condition of the original peritonitis. Again, the clinical pictures presented by septic peritonitis and obstruction are so similar that a diagnosis is out of the question, and, besides, the former affection may often coexist with the latter, which would necessarily still further obscure the nature of the lesions. It is therefore evident, if a patient does badly within the first week after operation and presents symptoms of aggravated traumatic peritonitis, septic inflammation, or obstruction, that the question of operative interference must be most carefully considered before final action is taken; otherwise the patient may lose her life as the result of an incorrect diagnosis. The extreme difficulty of distinguishing between these lesions is so great and the result of an analysis of the symptoms so problematic that I believe more lives would be saved by not interfering surgically than would be the case if the abdomen was frequently reopened and an occasional obstruction accidentally found.

On the other hand, a patient who does well up to the end of the first week, and then develops bad symptoms, is probably suffering from intestinal obstruction and not from septic peritonitis. I should not hesitate, therefore, to reopen the abdomen and search for an obstruction if constipation, vomiting, rapid pulse, intermittent abdominal pains, and tympany began to develop on or subsequent to the seventh day after operation.

In determining the presence or absence of obstruction it is important for the surgeon to bear in mind the various causes of intestinal blocking, and to

take into consideration the likelihood of the operation being followed by such a complication.

A consideration of the blood-findings in cases of intestinal obstruction will be found in Chapter III.

Prognosis.—Obstructions occurring within the first week after operation, as a rule, end fatally on account of the uncertainty of the diagnosis and the necessary delay or failure to reopen the abdomen. The prognosis, however, is good in cases in which the obstruction does not occur until after the seventh day, as the diagnosis can be made early and prompt surgical interference instituted. I have operated three times for post-operative intestinal obstruction occurring after the first week, and every case made a good recovery.

Treatment.—If the general condition of the patient is fairly good and immediate operation is not indicated, we should begin the treatment by endeavoring to secure a movement of the bowels by means of purgative medicines, high enemata, local applications to the abdomen, and change of position.

I begin at once with the administration of croton oil as follows: ℞. Croton oil, ♏j; glycerin, f℥j. M. Sig.—One to two teaspoonfuls every forty minutes. After giving the second dose of oil a high enema is injected into the bowel, consisting of olive oil, f℥vj, glycerin, f℥ij; spirits of turpentine, f℥j; sulphate of magnesia, ℥ij; soapsuds and water (105° F.), q. s. ad Oij. A turpentine stupe (see p. 854) is at once applied to the abdomen and the position of the patient frequently changed.

The enema should be repeated every hour or two and the patient's strength supported with small quantities of liquid diet and the administration of strychnin in doses of $\frac{1}{30}$ of a grain every three or four hours. If the treatment fails in the course of twelve or twenty-four hours to relieve the obstruction, operative interference should be instituted and the abdomen reopened.

Preparation of the Patient.—No preparation is required, except to catheterize the bladder and administer a hypodermic of $\frac{1}{15}$ of a grain of strychnin, until the patient is placed on the operating table, when she is covered with a woolen blanket and surrounded with hot-water bags to guard against the occurrence of shock. If the original abdominal dressings have not been removed, it is unnecessary to sterilize the abdomen, but if they have been changed the skin should be quickly prepared by mechanic means (scrubbing with soap and warm water) and the application of a solution of corrosive sublimate (1 to 1000), followed by sterile water.

Anesthesia.—The anesthetic should not be administered until the patient is placed on the table, and only a minimum amount of the drug should be employed. It is, therefore, imperative to have everything in readiness to begin the operation before the anesthetic is started. Chloroform, on account of its rapid assimilation, is preferable to ether.

Dressings.—The contents of the conveyance boxes are the same as given for abdominal operations on page 838.

Instruments.—(1) Scalpel; (2) scissors; (3) six short hemostatic forceps; (4) dressing forceps; (5) tissue forceps; (6) abdominal retractors; (7) Ashton's self-retaining abdominal retractors; (8) needle-holder; (9) three straight triangular pointed needles; (10) Nos. 2 and 7 braided silk; (11) silkworm-gut—20 strands; (12) intestinal instruments and needles—Murphy's button; anastomosis forceps; clamps; two straight and two curved intestinal needles (Figs. 782 and 783).

Operation.—The sutures are first removed from the incision and the abdomen reopened by separating the freshly united structures with the finger or the handle of a scalpel. If the situation of the obstruction is not discovered at once,

two fingers should be introduced into the abdominal cavity and a loop of ileum close to the cecum hooked up into the wound. If it is found to be collapsed, the bowel should be rapidly examined by pulling out loop after loop, while the assistant at the same time keeps pushing the intestine back into the abdominal cavity, until the obstruction is reached. If, however, the ileum is found to be distended at the ileocecal valve, the obstruction must be situated beyond that point, and, as a rule, the block will be discovered in the sigmoid flexure or the rectum.

The operative treatment of the obstruction depends upon the nature of the lesion and the character of the complications. Thus, it may only be necessary to separate a few adhesions; to cut a constricting band of inflammatory lymph; or to withdraw a knuckle of gut from a false aperture or slit. Again, if the bowel is torn during the manipulations, it must be sutured, and if gangrene has taken place at the seat of obstruction, the intestine must be resected. And, finally,

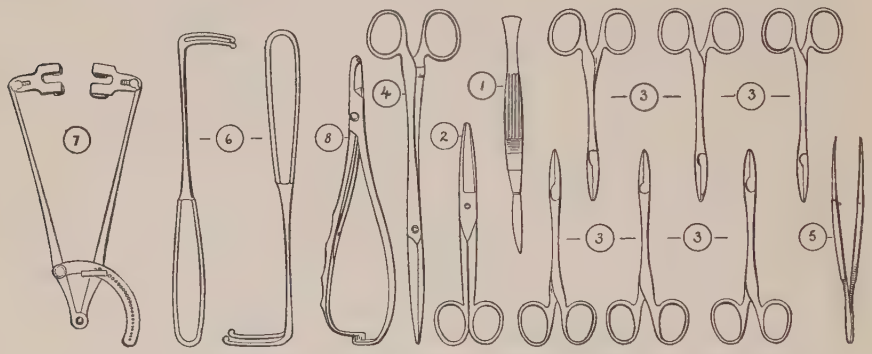


FIG. 782.—INSTRUMENTS USED IN OPERATING FOR INTESTINAL OBSTRUCTION (page 871).

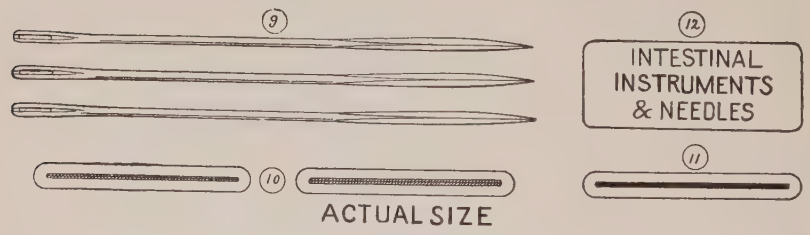


FIG. 783.—NEEDLES, SUTURE MATERIALS, AND INTESTINAL INSTRUMENTS AND NEEDLES USED IN OPERATING FOR INTESTINAL OBSTRUCTION (page 871).

if the patient is extremely weak and unable to stand the shock of a prolonged operation, it may be necessary to make a temporary artificial anus and repair the deformity at a later date.

After-treatment.—The management of the patient is the same as after an ordinary abdominal section, and she should be carefully watched to meet any indications which may arise. The bowels, as a rule, are moved spontaneously within a few hours, and it is therefore unnecessary to administer drugs, as the means which were employed to bring about an evacuation prior to the operation now have an opportunity to act.

The patient should be given liquid food by the mouth after the bowels are opened, and strychnin should be administered hypodermically so long as the necessity for stimulation exists. If resection or extensive suturing of the ileum has been done at the time of the operation, nutrient enemata should be admin-

istered for the first three or four days, and only a very small quantity of highly concentrated liquid food should be given by the stomach in case of necessity. If either of these procedures are performed on the lower end of the alimentary canal, rectal enemata are contraindicated, and the patient should be nourished exclusively by the mouth.

SUPPRESSION OF URINE.

Causes.—Suppression of urine after an operation may be due to acute or chronic nephritis and occlusion of one or both ureters with a ligature or a clamp. The latter cause is fully considered under Injuries of the Ureters, and will not be referred to here.

Suppression of urine due to nephritis is less commonly met at the present time than formerly, owing to the careful preparatory treatment of the patient; the rapidity of operations; the use of a minimum amount of ether; and the routine practice of injecting normal salt solution into the rectum before the patient is removed from the operating table.

Symptoms.—The complication is characterized by gradual diminution in the quantity of urine and the appearance eventually of uremic symptoms.

It must be borne in mind that the urine is greatly diminished in amount during the first day or two after operation, and that it may be reduced to 15 or even 10 ounces in twenty-four hours without causing anxiety, provided symptoms of uremia do not develop. After the first forty-eight hours the quantity slowly increases, and if all goes well the kidneys become normally active again about the twelfth day.

Treatment.—If the amount of urine continues to diminish after the second day, $\frac{1}{6}$ of a grain of spartein is given hypodermically every four hours and the bowels are evacuated with a purgative dose of citrate of magnesia. The patient is encouraged to drink freely of water, preferably distilled, and a high injection of normal salt solution is given by the rectum every five hours. Should the treatment not prove successful within twenty-four hours and the urine continue to decrease in amount, an intravenous injection of normal salt solution is given and repeated in six hours in the vein of the other forearm. In the meantime the hypodermics of spartein and the free use of water are continued, and $\frac{1}{20}$ of a grain of cocain in solution administered every hour by the mouth. Six hours after the second intravenous injection hypodermoclysis is practised under the left breast, and repeated, if necessary, under the opposite breast in the course of eight hours.

As a rule, the above treatment increases the renal activity and lessens the toxic effects of the urine. Sometimes, however, the symptoms become more marked and manifestations of uremia gradually develop. Under these circumstances a hypodermic of $\frac{1}{8}$ of a grain of pilocarpin is administered every two or three hours; intravenous injections are again resorted to; and one ounce of sulphate of magnesium given by the mouth. If the heart becomes rapid and weak, nitroglycerin and digitalin are administered hypodermically. Should convulsions occur and not yield to diaphoresis and catharsis, venesection should be resorted to and a pint or more of blood withdrawn from the circulation.

EMPHYSEMA OF THE ABDOMINAL WALL.

This condition may be caused by air being forced from the abdominal cavity into the subcutaneous tissues surrounding the wound, or it may be the result of infection from the *bacillus aërogenes capsulatus*, or gas bacillus. If the em-

physema is due to the gas bacillus, the prognosis is very grave; but if it is the result of air being forced into the tissues, the swelling disappears in from two to four weeks without causing any serious complications.

The emphysematous area, as a rule, is limited to the tissues in the immediate neighborhood of the wound, although in some cases it may extend well over the abdomen or even involve the chest as well.

I have had three cases of emphysema of the abdominal wall occurring in my practice. Two of the cases occurred after abdominal sections for pelvic lesions, and the complication was not suspected in either instance until the sutures were removed, when a small emphysematous swelling was found extending on both sides of the incision for a distance of about 2 inches. The wounds were not inflamed and union was complete; both patients recovered in about three weeks without any local treatment. The third case occurred in a woman who was sent to my clinic suffering from a large abscess of the left ovary. An emphysematous swelling was found, when the patient was admitted to the hospital, which involved the lower half of the left side of the abdominal wall and was unattended by any signs of inflammation. The diseased ovary was subsequently removed, and when the sutures in the abdominal wound were removed on the eighth day, the emphysema had entirely disappeared.

Treatment.—Emphysema caused by the forcible entrance of air into the tissues and unaccompanied by any evidence of infection in the wound requires no local treatment whatever, as the swelling usually disappears spontaneously by the time the patient is ready to leave the hospital. If, however, there is evidence of infection in the wound, an incision is made into the emphysematous swelling at once, and smear slide preparations obtained or cultures taken. Should the gas bacillus prove to be present, multiple incisions are made into the diseased area and the wounds irrigated with a solution of corrosive sublimate (1 to 1000) and packed with iodoform gauze.

THROMBOSIS OF THE FEMORAL VEIN.

Synonym.—Phlegmasia alba dolens.

Cause.—The etiology of the complication is not thoroughly understood, although in all probability it is due to a mild infection in the neighborhood of the vein which causes a phlebitis and the subsequent formation of a clot.

Symptoms.—The attack usually begins between the fourteenth and twenty-first day after operation; it may, however, occur earlier or be delayed longer. Up to the time of the appearance of the affection convalescence is perfectly normal, and there are no premonitory symptoms whatever to indicate anything being wrong in the condition of the patient.

Pain and swelling are the most characteristic symptoms of the affection, and are usually accompanied by a slight fever and an increased pulse-rate. The pain, as a rule, is first felt in the hip, and then rapidly extends down the thigh into the leg. In a short time afterward the thigh and leg begin to swell, and often within a few hours the entire limb is involved. The tissues become edematous and the skin white and tense. The vein is swollen and may be recognized upon palpation as a solid, irregular, cord-like structure. After the second day no spontaneous pain is felt, as a rule, and the patient complains only of slight discomfort in the affected limb.

In the majority of cases only one leg is affected, *usually the left*, but occasionally the opposite one may subsequently become involved.

The symptoms gradually subside as the circulation is re-established, and in the course of two or three weeks or longer the swelling entirely disappears. The

leg, however, may not recover its full power at once, and it may be weeks or even months before the lameness is entirely cured.

Prognosis.—The affection is never fatal unless a portion of the clot becomes detached and is swept into the circulation, causing an embolism of the pulmonary artery.

Treatment.—The patient is kept at absolute rest in bed and the affected limb supported on a soft pillow. The leg and thigh are then wrapped in a thick layer of cotton batting and slight pressure made with a flannel roller bandage. Liquid and soft diets should be employed, all alcoholic stimulants withdrawn, and the bowels opened every day with a mild laxative or a simple enema.

After the swelling has entirely disappeared the patient is allowed to get out of bed, but she must not be permitted to walk until a week later, and in the meantime she should rest on a lounge or sit in an easy chair with the limb supported on a level with the hips. When the patient is ready to walk, the cotton batting is removed and the limb wrapped in a flannel bandage, which should be worn continuously for several weeks, after which time an elastic stocking should be substituted.

When the pain is very severe at the beginning of the attack, lead-water and laudanum should be applied to the leg and the parts covered with oil silk. This dressing should be constantly applied for a day or two and the leg then wrapped in cotton batting as directed above.

STITCH-HOLE ABSCESS.

Causes.—A stitch-hole abscess may be caused by drawing the sutures too tight and strangulating the tissues. In some cases it may be directly due to an infected suture; or, again, the germs may be carried from the skin to the underlying tissues when the sutures are introduced to close the abdominal wound. Finally, the suture tracts may become infected by dragging septic material through them when the sutures are removed (see p. 848).

Symptoms.—The symptoms usually appear toward the end of the first week. The local reaction and general disturbance caused by a stitch-hole abscess are so slight that its presence is often not even suspected until the sutures are removed on the eighth day after the operation, when a small quantity of pus is found on the dressings and a drop of purulent matter is seen oozing from one or more of the openings of the suture tracts.

The patient seldom complains of pain or discomfort in the incision and the temperature and the pulse are but slightly affected. The fever rarely goes higher than 99.5° F., and the pulse-rate is only increased a few beats to the minute.

Diagnosis.—The slightest elevation of the temperature occurring after the "*post-operative rise*" has subsided should be investigated at once and the dressings removed so that the wound can be examined. If a stitch-hole abscess is present, a drop of pus is seen oozing at the point of entrance or exit of one of the sutures, and palpation reveals a small area of induration.

Prognosis.—A stitch-hole abscess is a very trivial complication provided the infection is limited to the sinus occupied by the suture, but when the suppurative process extends and involves the tissues on one or both sides of the incision, it usually results in the formation of a large pocket of pus which destroys more or less the union between the edges of the wound.

An uncomplicated stitch-hole abscess is easily cured by appropriate treatment in four or five days or a week.

Treatment.—So soon as the complication is discovered the infected sutures should be removed and the sinus tracts syringed once a day with hydrogen

peroxid, followed by liquefied carbolated oxid of zinc ointment (3 per cent.). A thick compress of gauze which has been saturated with a solution of corrosive sublimate (1 to 1000) is then laid over the wound and the usual dressings applied.

SUPPURATION IN THE ABDOMINAL WOUND.

Causes.—Suppuration in the abdominal wound may be due to a stitch-hole abscess, to infection of the tissues at the time of operation, and to careless hemostasis. Patients who are exhausted by disease and who are anemic are liable to suppuration on account of the loss of resistance in the tissues to infection. Sometimes an abscess may occur if the edges of the wound are uneven and ragged pieces of tissue are included within the line of union. Under these circumstances small areas of necrosis develop which subsequently become infected and form abscesses.

Dead spaces left between the lips of the wound in closing the incision are a common cause of post-operative suppuration, as blood or serum collects in the pouches and becomes infected. Suturing the wound in layers is therefore liable to be followed by this accident unless the greatest care is taken not to leave a pocket in which blood can accumulate. Again, the dead space which is always left immediately beneath the skin when the subcuticular suture is used is a strong reason against employing such a method in closing the abdominal incision. Occasionally the edges of the wound are bruised during the operation by rough manipulations or the pressure of instruments, such as hemostats or retractors, and the vitality of the tissues so impaired that an abscess may subsequently develop. Finally, suppuration is always liable to occur in women with fat belly walls, as the fatty tissues have a low vitality and poor resisting power.

Situation.—In the vast majority of cases the abscess forms in the subcutaneous layer of fat and points upward toward the surface without involving the muscular or aponeurotic structures. In comparatively rare instances, on the other hand, the suppurative process begins in the muscular layer, and although the abscess usually points toward the skin, it may, however, burrow downward and discharge into the peritoneal cavity.

Symptoms.—The symptoms develop, as a rule, during the second week after operation, although they may manifest themselves earlier or be delayed longer. Up to the appearance of the symptoms the patient's condition is perfectly normal and her recovery uneventful. At that time, however, the temperature becomes slightly elevated and the pulse increased in frequency. There is also more or less discomfort experienced in the wound, and as the suppurative process becomes intensified acute pain is felt in the line of the incision. So soon as the pus is evacuated, either spontaneously or artificially, the temperature and pulse fall and the local pain ceases.

In rare instances the symptoms may be ushered in by a chill and the temperature may rise suddenly to 102°–104° F. Usually, however, the fever is not high, and ranges between 99.5° and 101° F. The pulse is only slightly increased in frequency; its volume and force are unaffected; and its character gives no indication whatever of any serious complication occurring. The general condition of the patient remains good; the appetite is not impaired; there is no tendency to constipation; and the expression of the face is unchanged.

When the suppurative process begins in the muscular layer, marked symptoms of septicemia may develop and progressively continue until free drainage is established. If the abscess discharges into the peritoneal cavity, septic peritonitis rapidly intervenes and the patient eventually passes into collapse.

Diagnosis.—The diagnosis is based upon the discovery of the focus of infection, which will present itself as a circumscribed area of induration if pus has not formed; if, however, suppuration has occurred, fluctuation will be felt, and if the abscess has discharged its contents purulent matter will be found on the dressings and oozing from an opening in the abdominal wall.

Prognosis.—The prognosis is always good, so far as life is concerned, unless the abscess opens and discharges into the peritoneal cavity. Suppuration may weaken the abdominal wound and favor the occurrence of post-operative ventral hernia on account of interfering with firm union between the edges of the incision. Abscesses involving the subcutaneous fatty tissues have no effect upon the integrity of the wound, whereas those situated in the muscular layer are frequently followed by hernia. Again, the results of an abscess upon the strength of the incision depend upon its size and the extent to which the tissues have been undermined by burrowing.

The abscess cavity eventually closes by granulation and cicatrization, and the length of time required in healing varies from a few days to several weeks, according to the size of the original pocket of pus and the state of the patient's system.

An abscess occurring in a wound that is closed in layers with non-absorbable suture material has more serious consequences than one associated with a through-and-through suture, as it is always necessary in the former case to remove the sutures before healing can take place.

Treatment.—If the focus of infection is discovered before fluctuation is present, and it is impossible to determine where the abscess will point, the indurated area must be carefully watched, and opened at the earliest possible moment. There is seldom any necessity for making local applications to the wound, but if the pain becomes severe a hot-water bag may be placed over the dressings with decided benefit and comfort to the patient. Under no circumstances, however, should a poultice be applied to the incision, as it is liable to favor the excessive formation of pus and cause the edges of the wound to separate or break down.

So soon as pus manifests itself the abscess should be freely opened to prevent burrowing and to limit the area of destruction. A probe is then introduced through the opening and the limits of the abscess cavity determined (Fig. 784). If the line of incision is found to be undermined above or below the opening the skin edges of the wound should be separated with the finger or the handle of a scalpel, so as to convert the cavity into an open wound and expose all the blind pouches or culdesacs (Fig. 785). To accomplish this, it may be necessary in some cases to separate the skin union of the incision along its entire length, otherwise the wound cannot be dressed properly and healing will be greatly delayed. A general anesthetic is required only in very exceptional cases.

After the suppurating cavity has been completely exposed the wound is irrigated with hydrogen peroxid, followed by a solution of corrosive sublimate (1 to 1000), and packed with carbolated oxid of zinc ointment (3 per cent.); the usual dressings are then applied. The wound should be dressed once or twice a day until it contracts and eventually closes. When the granulation tissue reaches the level of the skin, it often becomes excessive (*proud flesh*) and requires an occasional application of the solid stick of nitrate of silver.

So soon as the suppurative process ceases, which is usually within two or three days after drainage has been established, and granulation tissue begins to form, the edges of the wound should be partially approximated after each dressing with narrow strips of zinc oxid plaster. A compress of gauze and absorbent cotton is then applied over all and secured in the usual manner.

If non-absorbable buried sutures were used to close the original incision in the abdominal wall, they must be removed so soon as the abscess cavity is opened and the wound then dressed as described above.

Getting Out of Bed.—If the abscess is limited to the subcutaneous fatty tissue, the strength of the incision is not weakened, and hence the patient is

Fig. 784.

Fig. 785.

Treatment of Suppuration in the Abdominal Wound (page 877).

Fig. 784, determining the limits of the abscess cavity by probing; Fig. 785, converting the cavity into an open wound by separating the skin.

allowed to get out of bed, as usual, on the twenty-first day. An abscess, however, occurring in the muscular layer impairs the union to a greater or lesser extent, and it is necessary, therefore, for the patient to remain in bed until the wound is nearly healed and the granulation tissue reaches the level of the skin.

SINUS TRACTS IN THE ABDOMINAL WALL.

Causes.—Sinus tracts in the abdominal wall following intraperitoneal operations are more or less frequently met, and usually occur in cases in which drainage is employed. Under these circumstances, if the seat of operation is septic the sutures and ligatures remaining within the pelvis or the abdomen become contaminated and cause a permanent sinus to form after the drainage is removed. In some cases, however, the drainage tract itself becomes infected as the result of carelessness in cleaning the tube, and the sutures within the pelvis become septic. In other cases, again, the infection may be due to delay in removing the gauze packing, which is likely to cause suppuration if left too long within the peritoneal cavity and thus infect the suture material.

A permanent sinus tract is especially liable to develop in cases in which the abdominal wall is sutured in layers with a non-absorbable material, as it may eventually irritate the tissues and cause suppuration. In rare instances the

silk sutures which are employed in the operation of ventral suspension of the uterus may eventually act as an irritant foreign body and cause a sinus. A permanent sinus tract is a rare post-operative complication when absorbable suture material is used, and it is advisable, therefore, to employ catgut in cases in which the seat of operation is septic or drainage is indicated.

Prognosis.—A sinus tract communicating with the pelvic or abdominal cavity will not close until the infected suture is either spontaneously discharged or removed by the surgeon. As a rule, the ligature is spontaneously expelled through the opening on the skin surface, but in rare instances it may ulcerate through into the bowel or the bladder and escape unnoticed. The spontaneous discharge of the ligature does not occur, as a rule, for several months after operation, and in some cases a year or even more may elapse before nature gets rid of the foreign material. Operative interference should be delayed as long as possible, as there is always some danger of a post-operative ventral hernia or death occurring when the abdomen is reopened to remove the infected suture.

A sinus tract caused by the presence of non-absorbable sutures in the abdominal wall or following an operation for ventral suspension of the uterus never heals spontaneously, as the foreign material is permanently fixed in the tissues and cannot be dislodged except by artificial means.

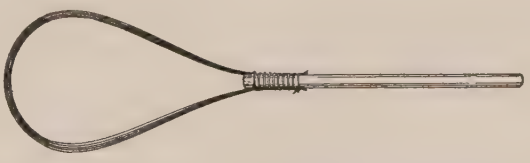


FIG. 786.—SNARE FOR REMOVING AN INFECTED SUTURE FROM A SINUS TRACT.
Shows the strands of silkworm-gut attached to a rounded piece of wood.

Treatment.—A sinus communicating with the peritoneal cavity should not be operated upon until repeated efforts have been made to extract the ligature with a snare and sufficient time has elapsed to render it probable that the foreign material will not be spontaneously discharged.

I am indebted to Dr. A. E. Spohn, of Corpus Christi, Texas, for the suggestion of a very simple method of extracting an infected suture which I have employed for several years with good results. The instrument which is used for the purpose is simple in its construction and easily made. It consists of a rounded piece of wood, a quarter of an inch in diameter and four inches long, to which five strands of silkworm-gut are attached by their free ends with strong thread in such a manner as to form a number of loops of equal length (Fig. 786).

The loops are then pressed together between the thumb and the index-finger in order to make the strands lie close to each other and thus facilitate their introduction into the sinus (Figs. 787 and 788).

Before attaching the strands of silkworm-gut to the piece of wood the sinus should be explored with a flexible probe to determine its length, so as to know how long to make the loops. If they are too short and do not reach to the bottom of the sinus, the ligature will not be ensnared; if, on the other hand, they are too long, the instrument is difficult to manipulate, as there should not be more than one inch of free silkworm-gut between the opening of the sinus and the end of the wooden handle after the snare is inserted. Again, the preliminary use of a

flexible probe indicates the direction of the sinus, which is a valuable guide and materially aids in the introduction of the loops.

The instrument is used as follows: The loops are held between the thumb and the index-finger and gradually pushed into the sinus until its bottom is reached (Fig. 789). The handle is then steadily rolled between the thumb and the finger. The rotary movement is communicated to the loops of silkworm-gut, and the strands becoming twisted entangle the infected ligature. The

Fig. 787.—Snare for Removing an Infected Suture from a Sinus Tract (page 879).
Shows the loops being pressed together.

Fig. 788.—Snare for Removing an Infected Suture from a Sinus Tract (page 879).
Shows the shape of the snare after the loops have been pressed together.

handle is now held firmly so as to prevent untwisting and the loops slowly withdrawn from the sinus along with the ensnared ligature. If, however, the manipulation has been unsuccessful, the loops are again introduced into the sinus and the process repeated.

The sensation conveyed to the fingers when the infected ligature is ensnared is characteristic and easily recognized after a little practice. When the loops have been twisted, a slight pull will be sufficient to inform the surgeon whether the ligature has been caught or not. If it has become entangled, a decided sense

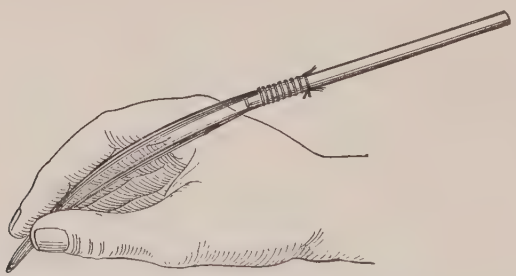


Fig. 789.—Snare for Removing an Infected Suture from a Sinus Tract.
Shows the method of holding the snare while it is being passed into the sinus.

of resistance is felt upon attempting to withdraw the snare. If this resistance is not felt, the loops are allowed to untwist themselves, and again twisted, by rotating the handle of the instrument, after being pushed to the bottom of the sinus.

The silkworm-gut being flexible and at the same time somewhat stiff, it will follow even a tortuous sinus with the greatest ease provided care and skill are used in manipulating the snare.

If the surgeon does not succeed in extracting the suture, an expectant plan

of treatment should be carried out until the necessity for operative interference becomes apparent, and in the meantime an occasional effort should be made to snare the foreign material. It not infrequently happens that the granulation tissue at the opening of the sinus grows together and obstructs the drainage. When this takes place, the proud flesh should be cut away with scissors from time to time and touched with the solid stick of nitrate of silver in order to give free vent to the discharge.

Operative Interference.—The infected ligature can be reached by either an *extraperitoneal* or an *intraperitoneal operation.*

Extraperitoneal Operation.—A flexible probe is passed to the bottom of the sinus and an incision made through the cicatrix of the original abdominal wound above and below the fistulous opening down to the peritoneum. The lower part of the sinus which is located by the probe is now dilated with the blades of a pair of straight dressing forceps and the ligature seized and extracted with long tissue forceps or a blunt-pointed tenaculum.

Intraperitoneal Operation.—This operation should not be performed until an effort has been made to extract the foreign material by the extraperitoneal method described above. If this fails, the incision above the sinus is extended into the peritoneal cavity without removing the flexible probe, which is kept in position to locate the situation and extent of the fistulous tract. After opening the abdominal cavity one or two fingers are introduced through the wound and the end of the probe located by touch. The adherent coils of intestine are then carefully separated along the probe down to the bottom of the sinus and the infected ligature exposed. It is then seized with tissue forceps and removed. The abdominal wound is then sutured and the dressings applied in the usual manner. The question of drainage depends upon the indications, although, as a rule, it is safer to employ a glass tube surrounded by a strip of gauze for the first forty-eight hours in order to isolate the sinus tract and protect the peritoneal cavity.

Infected Sutures in the Abdominal Wall.—As stated elsewhere, a sinus resulting from the presence of non-absorbable sutures in the abdominal wall is never spontaneously cured, and hence it should be relieved at once by operative means.

The operation is very simple and does not involve opening the abdominal cavity. A short flexible probe is passed to the bottom of the sinus and an incision is then made through the cicatrix of the abdominal wound above and below the fistulous opening. This incision is cautiously extended downward until the bottom of the sinus is reached and the infected ligature exposed to view. After removing the suture the wound is dressed in the manner described under the treatment of Suppuration in the Abdominal Wound.

VENTRAL HERNIA.

Causes.—There are several causes of post-operative ventral hernia, and all result in a separation of the edges of the fascia in front of the recti muscles. The strength of the abdominal wall in this situation depends upon the integrity of the aponeurotic layer, and if its margins are not brought in accurate contact when the wound is sutured, a hernia is likely to result. The use of drainage is also a cause of the complication. The edges of the aponeurosis where the tube or the gauze passes through the belly wall cannot be approximated, and hence the slightest exciting cause may result in the protrusion of the intestine at that point. Abscesses in the abdominal incision interfere with the union of the fascia and predispose to the development of a hernia. Again, in certain condi

tions of malnutrition union is either delayed or so interfered with that hernia results. Separation of the fascia may also be due to getting up too soon after operation, heavy work or lifting of any kind, straining at stool or vomiting, and carelessness in the use of the abdominal bandage.

Severe attacks of vomiting occurring after the stitches are removed are likely to cause a rupture, and for this reason the patient should not take a sea voyage for at least one year after operation. Heavy work and lifting must be avoided, but if this is impossible owing to the circumstances of the patient, care must be taken to keep the abdominal bandage firmly applied.

Symptoms.—The *subjective symptoms* caused by a ventral hernia are not constant and vary in different individuals. Pain may be felt at the site of rupture and there may be frequent attacks of colic, due to slight kinking of the intestine from adhesions in the neighborhood of the hernial opening. The bowels are apt to be more or less constipated and the digestion is frequently disturbed. Again, adhesions in the lower abdomen may cause vesical disturbances, and, finally, nervous symptoms may gradually manifest themselves.

The *objective symptoms* are the same as in other forms of hernia.

Prognosis.—There is but little danger, as a rule, to be apprehended from a ventral hernia, yet cases have been met in which spontaneous rupture of the sac has taken place and strangulation has occurred. In some instances the protrusion of the intestines forms such an enormous tumor that the patient is unable to attend to her duties and she becomes a hopeless invalid.

A post-operative ventral hernia is never cured except by a radical operation which is usually successful if the separation of the abdominal wall is not too extensive and the surrounding structures have not become atrophied. A properly applied abdominal bandage and truss will effectually support the hernial protrusion and make the patient comparatively comfortable. The tendency of a hernia is to gradually grow larger, and although the use of a support will often prevent this occurring, yet the only rational plan of treatment is to perform the radical operation.

Treatment.—The treatment may be *palliative*, or the use of a support, and *radical*, or the closure of the hernial opening by an operation.

These plans of treatment have no gynecologic significance, and the reader is therefore referred to special works on hernia for the technic details.

FECAL FISTULAS.

Causes.—A fecal fistula following an abdominal or pelvic operation may be due to the following causes:

Injury to the coats of the intestine in separating adhesions.
Necrosis of the intestine from contact with an inflammatory mass.
Leakage after suturing an injury of the intestine or making an anastomosis.
Pressure necrosis from a glass drainage-tube.

Prognosis.—A fecal fistula seldom causes dangerous symptoms, and, as a rule, heals spontaneously in from a few days to one year. In exceptional cases an abscess may form in the neighborhood of the fistulous tract or an obstruction may gradually develop and threaten the patient's life. If a fistula does not heal within twelve months after it appears, the chances are that spontaneous closure will never take place, and hence operative interference is indicated.

Treatment.—So soon as a fecal fistula makes its appearance, which is usually about three days after an operation, the margins of the fistulous opening and the surrounding skin should be kept clean with soap and warm water and

protected from irritation with carbolated oxid of zinc ointment (3 per cent.). The dressings should be changed several times a day or so often as they become soiled.

During the first week after the fistula develops nothing should be done to assist nature in closing it, as the adhesions which isolate or shut off the sinus tract from the peritoneal cavity are not sufficiently strong to permit of local applications being made. At the end of that period, however, the sinus should be washed out daily with a hot normal salt solution, followed by an injection of hydrogen peroxid. In washing out the fistula a fountain syringe with a small glass nozzle should be employed and the salt solution allowed to flow directly into the bowel; the hydrogen peroxid should be injected with a small glass syringe. Under this treatment the sinus, as a rule, gradually contracts, and finally closes in the course of a few days or weeks. If, however, it refuses to heal, the cause will usually be found to be an infected ligature or suture, which must be located and removed by a snare (see Simple Sinus Tracts, p. 879) before the fistula can close.

Operative Interference.—The radical operations for the cure of a fecal fistula have no gynecologic significance, and the reader is therefore referred to special works upon the surgery of the intestines for technic details.

GENERAL OPERATIVE TECHNIC.

MEDIAN ABDOMINAL INCISION.

Position.—The incision is made in the median line through any part of the abdominal wall between the center of the symphysis pubis and the end of the sternum. In the majority of gynecologic operations the abdomen is opened between the pubes and the umbilicus, but occasionally it may be necessary to extend the incision upward to the ensiform cartilage.

Limitations.—An incision below the umbilicus is employed to expose the internal organs of generation, the bladder, and the pelvic portions of the ureters, and one extending above to deliver a large solid tumor or deal with complications involving the viscera in the upper half of the abdominal cavity.

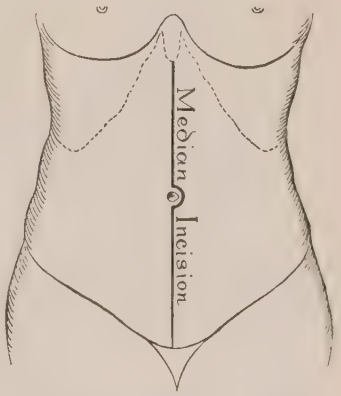


FIG. 700.—DIAGRAM SHOWING THE POSITION OF THE MEDIAN ABDOMINAL INCISION.

Length.—The abdomen should never be opened by an incision of more than 1½ inches in length, which is long enough to enable the operator to introduce one or two fingers and explore the peritoneal cavity. The length of the incision can then be easily increased if necessary and ample room obtained. The incision should always be as small as is consistent with the operative indications, as an unnecessarily long wound adds to the danger of post-operative hernia, favors the escape of the intestines, and exposes the peritoneum to undue irritation. On the other hand, if the incision is too small, the edges of the wound are likely to be bruised during the operative manipulations, the movements of the surgeon are hampered, and the field of operation cannot be exposed to view when it becomes necessary to combine sight and touch in dealing with complications.

Method of Making the Incision.—First Step.—Place the index-finger on one side of the median line and the thumb on the other and make the intervening skin tense.

FIG. 791.—MEDIAN ABDOMINAL INCISION—**First Step.**

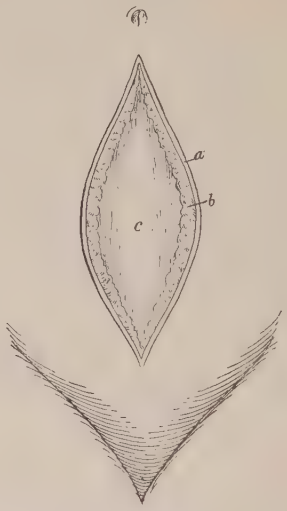


FIG. 792.—MEDIAN ABDOMINAL INCISION—**Second Step.**

a, Skin; *b*, superficial fascia; *c*, aponeurotic fascia.

Second Step.—Map out with the eye the situation and extent of the incision, and with one or two sweeps of the scalpel cut through the skin down to the aponeurotic fascia in front of the recti muscles.

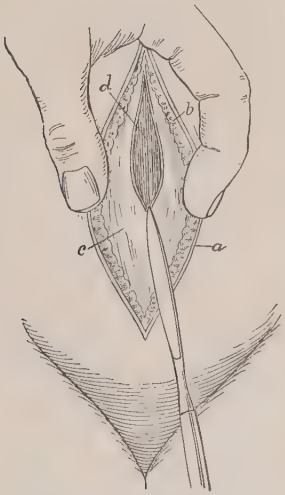


FIG. 793.—MEDIAN ABDOMINAL INCISION—**Third Step.**

Showing the aponeurosis being divided: *a*, Skin; *b*, superficial fascia; *c*, aponeurotic fascia; *d*, fibres of recti muscles.

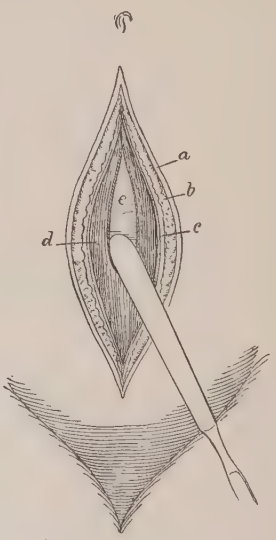


FIG. 794.—MEDIAN ABDOMINAL INCISION—**Fourth Step.**

Showing the fibers of the rectus muscle being separated: *a*, Skin; *b*, superficial fascia; *c*, aponeurotic fascia; *d*, rectus muscle; *e*, transversalis fascia.

Third Step.—The wound is then held apart with the thumb and the index-finger of the left hand and the aponeurosis divided with the scalpel. It is unnecessary to follow the linea alba.

Fourth Step.—The fibers of the rectus muscle are now separated with the handle of the scalpel and the transversalis fascia exposed by retracting the edges of the wound with the thumb and the index-finger.

Fifth Step.—The fascia along with the subperitoneal fatty tissue is then picked up by two hemostatic forceps and divided with the scalpel down to the peritoneum.

Sixth Step.—The peritoneum is then lifted up in the same way and rolled between the thumb and the index-finger to ascertain whether or not a knuckle of gut is adherent.

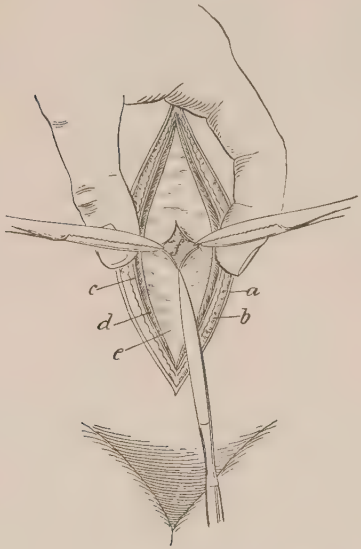


FIG. 795.—MEDIAN ABDOMINAL INCISION—Fifth Step.

Showing the transversalis fascia and the subperitoneal fatty tissue being divided: *a*, Skin; *b*, superficial fascia; *c*, aponeurotic fascia; *d*, rectus muscle; *e*, transversalis fascia; *f*, peritoneum.

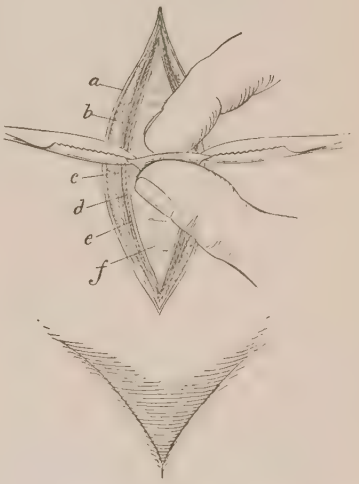


FIG. 796.—MEDIAN ABDOMINAL INCISION—Sixth Step.

Showing the peritoneum being rolled between the thumb and index-finger: *a*, Skin; *b*, superficial fascia; *c*, aponeurotic fascia; *d*, rectus muscle; *e*, transversalis fascia; *f*, peritoneum.

Seventh Step.—A small nick is then made in the peritoneum and the index-finger introduced through the opening. The incision is then enlarged to the full length of the skin wound with blunt-pointed scissors guided by the fingers in the abdominal cavity. So soon as the peritoneum is opened air rushes in and slightly distends the abdominal wall, and the viscera recede from the wound unless they are adherent.

Hemorrhage.—The slight amount of capillary oozing which ordinarily occurs in the wound is of no practical importance, as it always ceases spontaneously by the time the peritoneum is opened. When extensive intraperitoneal adhesions exist, however, the vessels in the abdominal wall are more or less dilated, and it is therefore not uncommon to meet free oozing or spurting arteries. Under these circumstances the bleeding must be checked before the peritoneum is opened, otherwise the blood will obscure the field of operation and gain entrance into the peritoneal cavity (see Operative Complications, p. 908).

Enlarging the Incision.—When it is necessary to enlarge the incision, the index and middle fingers of the left hand are introduced into the abdominal cavity and placed with their palmar surfaces in contact with the parietal peritoneum. The under blade of a pair of blunt-pointed scissors is then inserted between the peritoneum and the fingers and the incision enlarged by slowly cutting through all the structures of the abdominal wall.

If it is necessary to extend the wound beyond the umbilicus, the incision should encircle it to the left in order to escape wounding the suspensory ligament of the liver.

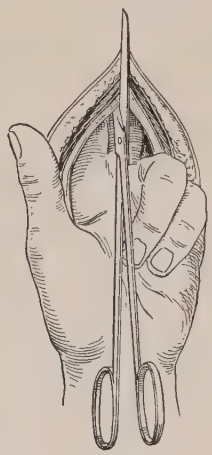


FIG. 797.—MEDIAN ABDOMINAL INCISION.
Showing the method of enlarging the incision.

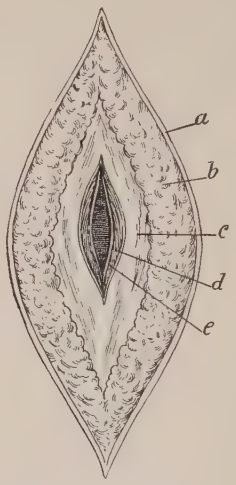


FIG. 798.—MEDIAN ABDOMINAL INCISION.
Showing the method of making the incision in fat women. Note the length of the incision through the skin and subcutaneous fatty tissue: *a*, Skin; *b*, subcutaneous fatty tissue; *c*, aponeurotic fascia; *d*, rectus muscle; *e*, peritoneum.

The Incision in Fat Women.—In cases in which there is a very thick deposit of subcutaneous fatty tissue in the abdominal wall it is impossible to operate with any degree of freedom through a small incision if the wound is of equal length from the skin surface to the peritoneum. Under these circumstances additional room is gained without increasing the length of the incision through the aponeurosis, and the movements of the operator are facilitated by making a long opening through the skin and superficial fascia down to the aponeurotic layer in front of the recti muscles and a short one beyond that point.

EXPLORATION OF THE PERITONEAL CAVITY.

Touch.—So soon as the peritoneal cavity is opened and the length of the incision in the peritoneum extended to the limits of the skin wound, the operator introduces the index and middle fingers in order to verify the diagnosis, ascertain the nature of any complications that may be present, and determine whether the case is operable or not. If the lesions are limited to the pelvis, the incision is then enlarged to meet the operative indications; but if it is found to be necessary to explore the general abdominal cavity, the opening should first be made long enough to admit the hand for purposes of investigation and then subsequently extended above the umbilicus should the conditions demand it.

The examination by touch is facilitated by having the patient's pelvis elevated in the Trendelenburg position.

Inspection.—Before proceeding with the operation or deciding how to deal with the existing complications it is necessary in some cases to place the patient in a position of marked pelvic elevation (45 degrees) and retract the edges of the wound in order that the pelvis may be thoroughly exposed to view and the nature of the lesions carefully inspected. The incision should not be enlarged in order to make this examination unless the operator finds that it is too small and that additional room is required.

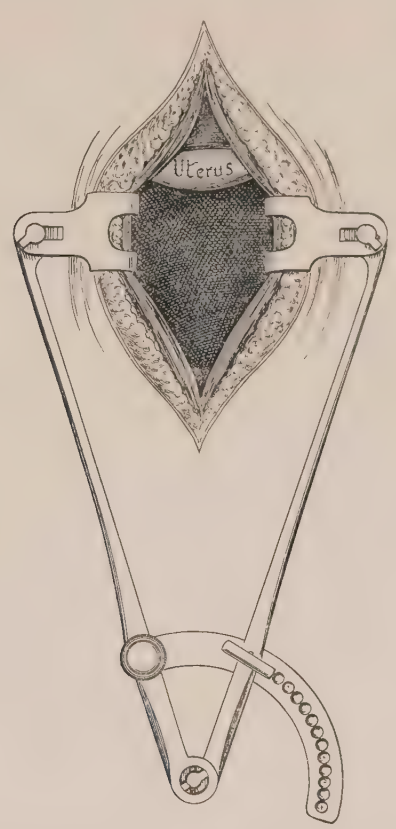


FIG. 799.—EXPLORATION OF THE PERITONEAL CAVITY BY INSPECTION.
Shows the patient in the Trendelenburg position and the edges of the abdominal incision held apart by Ashton's self-retaining retractors.

Retractors.—The edges of the wound may be held apart by ordinary abdominal retractors (Fig. 801); by Ashton's self-retaining bivalve retractors; and by using the index and middle fingers of both hands (Fig. 802).

Ashton's retractors have the advantage of being self-retaining, and therefore the assistant's hands do not obscure or interfere with the field of vision. Furthermore, they can be adjusted so as to make a minimum amount of pressure upon the edges of the wound, which is important because the ordinary retractors are apt to bruise the tissues and destroy their vitality. The instrument is made with either fixed or adjustable blades; in the latter case the blades are of three

sizes and move upon a pivot which permits a more even contact with the margins of the incision.

Trendelenburg Position.—Apparatus.—In my service at the Medico-Chirurgical Hospital I employ Boldt's operating table (Fig. 2), which has a conveniently arranged and simply constructed Trendelenburg attachment, and in private practice I use Lentz's modified McKelway frame (Fig. 908), which also answers every indication.

Advantages.—1. When the pelvis is raised, the intestines fall toward the diaphragm and the pelvic cavity is exposed to view. This is accomplished by

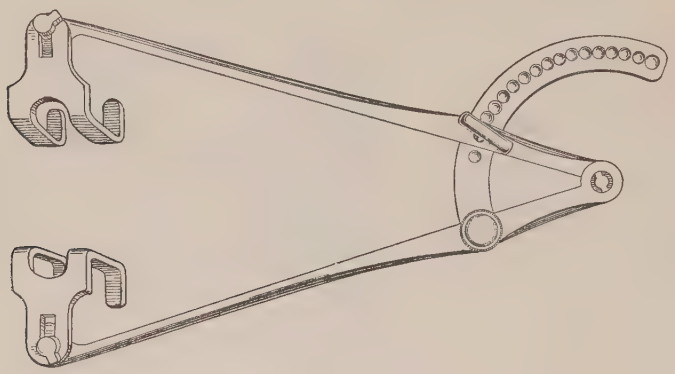


Fig. 800.—Ashton's Self-retaining Abdominal Retractors.

gravity, and hence the intestines are not bruised or irritated, as would be the case if they were constantly handled to keep them away from the field of operation.

2. The enucleation of extensively adherent lesions and the removal of the uterus or other organs may be more satisfactorily and rapidly performed, as the various steps of the operative technic are carried out under direct inspection.

3. The source of a hemorrhage can be quickly located and prompt means taken to control the bleeding.

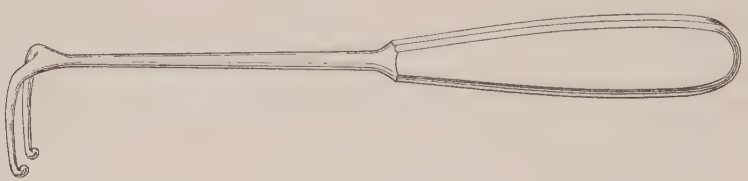


Fig. 801.—An Abdominal Retractor (page 887).

4. The tendency to shock is reduced to a minimum, and operations otherwise hazardous can be performed with comparative safety.

Precautions.—There are certain dangers connected with the use of the Trendelenburg position which must be borne in mind and guarded against.

1. The weight of the intestines upon the diaphragm may be so great when the pelvis is raised to an angle of 45 degrees or more that respiration is impeded and dangerous symptoms are likely to intervene, especially in stout women. If, therefore, the patient develops sonorous breathing and becomes cyanosed, the pelvis should be lowered at once in order to remove the pressure from the diaphragm and re-establish normal respirations.

2. In cases of pus collections in the pelvis the purulent material will gravitate into the general peritoneal cavity and cause septic infection unless the accident is guarded against during the enucleation of the sac. Before attempting its removal the field of operation should be isolated with large and small gauze pads and the pelvis lowered to an angle of 10 to 15 degrees. In this way the force of gravity is lessened, and if the sac ruptures, its contents are caught in the meshes of the gauze packing.

3. The Trendelenburg position may temporarily check bleeding from vessels which have been severed during the operation and a serious or fatal hemorrhage may take place after the patient is lowered to the horizontal recumbent position. This accident may be prevented by loosely packing gauze about the field of operation and lowering the pelvis to an angle of 5 degrees before introducing the through-and-through sutures into the abdominal incision. After the sutures are all in place the lips of the wound are retracted and the gauze removed. If there has been bleeding from a vessel which was overlooked, the gauze will be more or less saturated with blood and the source of the hemorrhage can be located before suturing the aponeurotic layer with catgut and closing the abdominal incision.

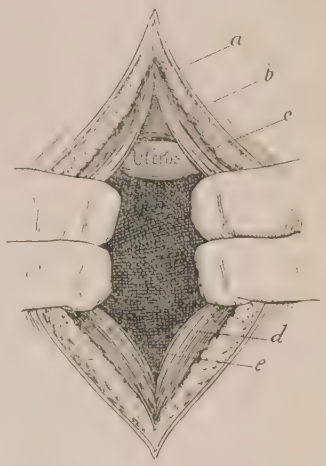


FIG. 802.—EXPLORATION OF THE PERITONEAL CAVITY BY INSPECTION (page 887).

Shows the patient in the Trendelenburg position and the edges of the abdominal incision held apart by the index and middle fingers of both hands.

Degree of Elevation.—There are no advantages to be gained by elevating

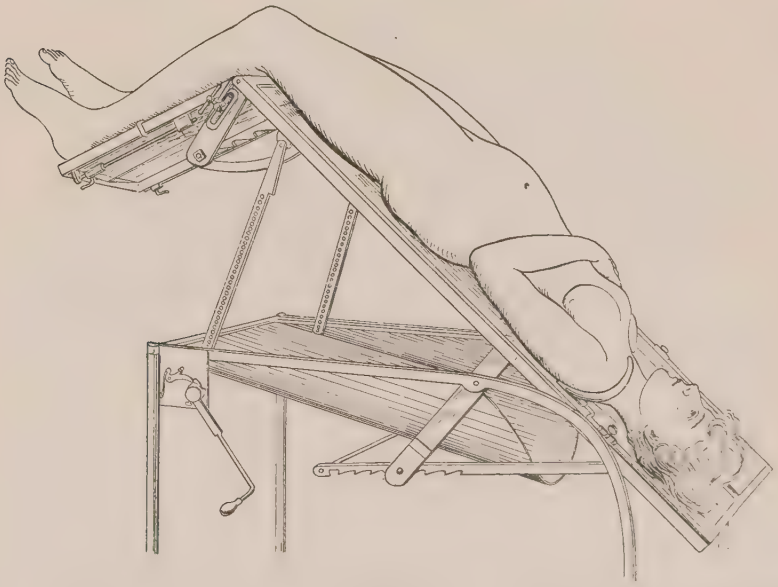


FIG. 803.—BOLDT'S OPERATING TABLE WITH THE TRENDELENBURG FRAME ELEVATED AND THE PATIENT IN POSITION.

the patient higher than the indications require, and she should not be kept at a marked angle longer than necessary. I use an elevation of 25 degrees while the abdominal incision is being made and then raise the body to a higher angle

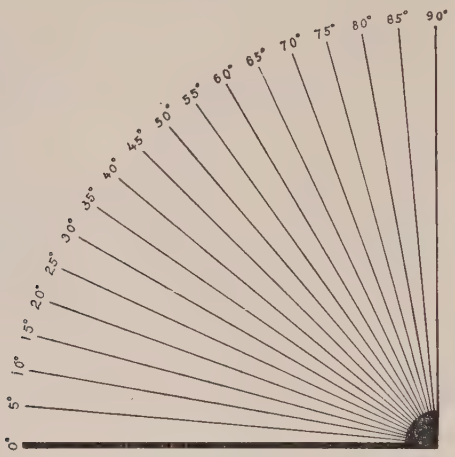


FIG. 804.—THE TRENDELENBURG POSITION.
The heavy black horizontal line indicates the level of the top of the operating table and the light lines represent the elevation of the Trendelenburg frame from 5 degrees to 90 degrees.

if necessary. In most cases an elevation of 25 degrees will be sufficient for all practical purposes, but occasionally it may be found necessary to use an angle of 45 degrees or even more.

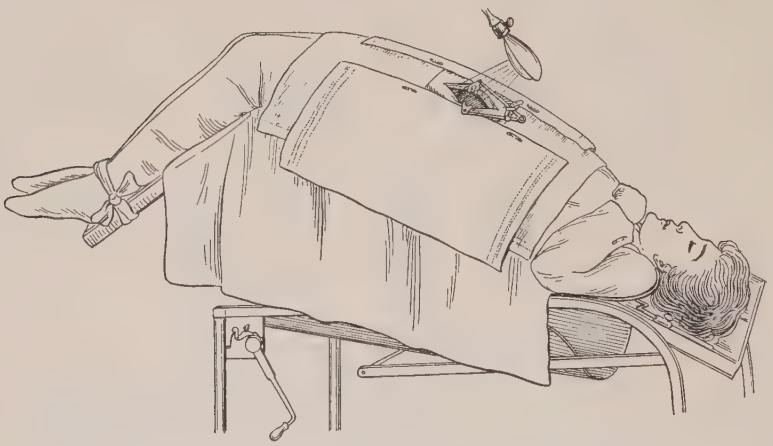


FIG. 805.—EXPLORATION OF THE PERITONEAL CAVITY BY INSPECTION.
Shows the patient in the Trendelenburg position and the pelvic cavity illuminated by a portable electric bulb.

Illumination of the Pelvic Cavity.—The field of operation, as a rule, is sufficiently illuminated by the light that is obtained through the windows in the ceiling and the side wall of the operating room without resorting to artificial means. In some cases, however, it may be necessary to use a portable

electric bulb with a reflector and throw the light directly into the pelvis. The light is held by an assistant and its rays directed to different parts of the pelvis according to the instructions given by the operator.

COVERING RAW SURFACES WITH PERITONEUM.

Raw surfaces should not be left exposed in the pelvic or abdominal cavity, as they may be the source of serious oozing or foci of septic infection. Again, a knuckle of gut may become adherent to the denuded area and a fatal obstruction result from kinking.

Whenever possible, the edges of the surrounding peritoneum should be drawn over the raw surface and approximated by a continuous suture of silk or catgut. This rule applies to denuded areas on the surface of all the abdominal and pelvic viscera and also to the raw ends of the stump of a pedicle.

The technic of an operation should, if possible, provide for a flap of peritoneum which can be used to cover a raw surface that is likely to be made at the time. Thus, for example, in performing a supravaginal hysterectomy a peritoneal flap is stripped from the anterior surface of the uterus and used to cover the cervical stump after the organ has been amputated.

TOILET OF THE PERITONEUM.

Before the sutures are introduced into the abdominal incision the field of operation and the surrounding parts are carefully inspected and all fluids or foreign material removed by (*a*) dry sponging; (*b*) local washing; and (*c*) general flushing of the abdominal cavity.

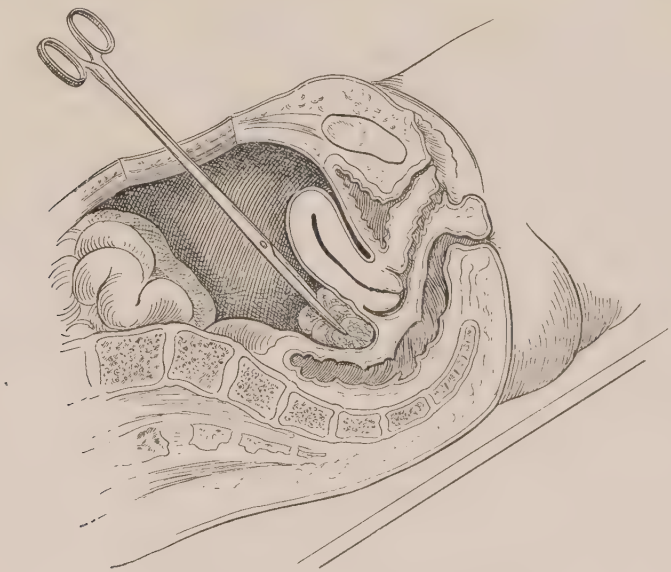


FIG. 806.—TOILET OF THE PERITONEUM (page 892).
Shows dry sponging of the culdesac of Douglas by direct inspection of the pelvic cavity.

Fluids and discharges gravitate, as a rule, into the *culdesac of Douglas*, the *vesico-uterine space*, and the *kidney hollows*, and each of these pouches must therefore be inspected.

Dry Sponging.—This is the most convenient and efficient method of cleaning and drying the parts and the one most frequently employed. The modern technic of isolating the field of operation by means of the Trendelenburg position and the use of gauze pads confines the fluids or discharges to restricted areas and enables the surgeon to quickly remove all traces of contamination with dry gauze sponges. This method causes little or no irritation to the peritoneum and does not spread the infection to the general peritoneal cavity.

The cleaning is accomplished with a small dry gauze sponge which is held in the grasp of straight dressing forceps and passed through the abdominal incision down to the pouches within the pelvis and abdomen. The patient's body should be elevated to an angle of from 25 to 40 degrees, and if the incision is over two inches long, its edges should be kept apart by Ashton's self-retaining retractors; otherwise the sponge should be guided by the index and middle fingers of the left hand in the abdomen. The sponging should be continued until all the foreign material is removed and the parts made perfectly dry. A loose gauze packing is then placed in the culdesac of Douglas and the vesico-uterine space and allowed to remain until the abdominal incision is about to be closed (Fig. 806).

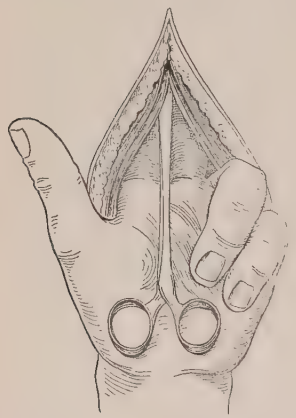


FIG. 807.—TOILET OF THE PERITONEUM.

Shows dry sponging of the peritoneum with the forceps guided by the index and middle fingers of the left hand.

Local Washing.—This method is indicated when the field of operation is septic and the infection does not extend to the general peritoneal cavity. The patient is placed in the Trendelenburg position (from 25 to 40 degrees) and the edges of the wound held apart by self-retaining retractors. The intestines are then covered with two or three large gauze pads which are carefully placed and their lower edges brought to a level with the brim of the pelvis. A gauze sponge held by dressing forceps is then dipped in normal salt solution (110° F.) and the seat of operation gently swabbed while the fingers of the left hand hold the gauze pads in place. The process is repeated several times until the septic material has been removed, when the parts are wiped dry and a temporary packing of gauze placed in the culdesac of Douglas and the vesico-uterine space.

General Flushing.—The routine practice of some operators of flushing the general peritoneal cavity with a normal solution of salt or plain sterile water after every abdominal section should be condemned as being unscientific and at times dangerous to the life of the patient. General flushing is indicated only when blood, septic discharges, and material from the cavity of a cyst have been scattered through the abdominal cavity either before or during the operation. Under these circumstances irrigation is the best means to remove the foreign matter, and it should always be employed notwithstanding the fact that it is impossible to render the peritoneal cavity perfectly clean. When the discharges are aseptic, this fact is of but little importance, as the peritoneum rapidly absorbs what remains; if, however, they are septic, death is practically certain to result from peritonitis, as the flushing cannot dislodge the infected material which is firmly adherent to the peritoneal surface of the intestines. General irrigation should never be employed to remove localized collections of debris or discharges, as it always spreads the infection and endangers

the life of the patient. In an aseptic case in which shock is threatened a quart or more of normal salt solution (110° F.) may be poured into the abdominal cavity and allowed to remain with advantage as a stimulant; but apart from this it serves no useful purpose, as post-operative thirst is usually controlled by giving enteroclysis before the patient leaves the operating table.

General abdominal irrigation is given as follows: The solution is mixed in the graduated reservoir at the proper temperature (110° F.) by pouring hot and cold normal salt solution directly into it from the flasks, or, if sterile water is used, from pitchers containing hot and cold water. When the thermometer in the reservoir registers 110° F., some of the fluid is allowed to run out into a bucket in order to get rid of the cold solution in the rubber tubing and heat the irrigating nozzle. The patient is then placed at an angle of 10 degrees and the lips of the wound held apart with self retaining retractors or with the fingers of the left hand. The reservoir is now held about three feet above the patient and the operator directs the flow of the solution to all parts of the abdominal cavity by means of the irrigating nozzle which he holds in his right hand.

After the abdomen becomes filled with the fluid it overflows through the incision and is drained into a receptacle under the operating table. When the cavity has been sufficiently flushed, the patient is lowered to the horizontal position and the fluid forced out by compressing the abdominal walls with the hands. The peritoneum is then thoroughly dried with gauze sponges and the fluid removed from the culdesac of Douglas, the vesico-uterine space, and the kidney hollows.

ABDOMINAL AND PELVIC DRAINAGE.

Indications.—The indications for drainage depend largely upon the technic skill of the operator and the thoroughness of his antiseptic methods. During the early days when abdominal and pelvic surgery were in an evolutionary stage drainage was very commonly practised, but later on the pendulum of professional opinion swung to the opposite extreme, and it was very seldom, if at all, employed by the majority of the best operators. At the present day, however, the tendency among some of the leading surgeons is to take a middle course of action and to employ drainage when in their judgment or experience the absorbent powers of the peritoneum should not be solely relied upon to carry off the fluids which may accumulate in the peritoneal cavity.

The operator is naturally not responsible for the pathologic findings within the abdomen or the pelvis, and when drainage in his judgment is required to meet certain well-defined conditions, it is not an admission upon his part of lack of skill, nor should the use of drainage under these circumstances be denounced as not being ideal surgery, as its object is to save life, and, after all, that is the only standard by which an operation can be judged. When an operator is confronted with conditions which demand the choice of evils, he must select the one least harmful to his patient, and while the immediate or remote dangers of drainage must be admitted and carefully considered, yet he should employ it whenever indicated to save life, even if the so-called ideals of surgery are overthrown and destroyed.

The following are the chief indications for drainage:

To guard against septic infection.

To watch for secondary hemorrhage.

To Guard Against Septic Infection.—The danger of septic infection following an abdominal or pelvic operation is the most important indication for drainage, and the frequency with which it is employed for this purpose depends upon the judgment and skill of the operator.

In order to understand the question of drainage as a safeguard against infection we must first have a clear conception of the various ways the accident may occur after an abdominal operation, and also bear in mind that the absorptive power of the peritoneum, which is normally very active, may become greatly diminished on account of the exposure or injury to which the peritoneal surfaces are necessarily exposed during the operative manipulations.

Infection may occur from the following causes: (1) From septic pus or cyst contents coming in contact with the peritoneum; (2) from sterile discharges becoming subsequently infected; (3) from the presence of infected tissues which cannot be entirely removed at the time of operation; (4) from injuries of the intestine, the bladder, or the ureters when leakage occurs and the discharge escapes into the peritoneal cavity.

From Septic Pus or Cyst Contents.—In cases in which a non-localized suppurative process is present drainage is indicated, but when the purulent collection is contained in a sac which can be removed without rupture, there is little or no danger of infection occurring, and hence drainage is unnecessary. In cases of localized collections of pus, such as a tubal or ovarian abscess, drainage is seldom required even when the sac ruptures and its contents escape over the peritoneum, for the reason that the purulent matter is sterile in about 50 per cent. of the cases. It is important, therefore, in such cases, to have an immediate bacteriologic examination made of the pus, and if it is found to be sterile, the abdomen is closed; otherwise drainage should be employed. If, however, the surrounding parts are well protected with gauze pads and the septic pus does not come in contact with the peritoneum when the sac ruptures, there is no necessity for drainage, especially if the operator thoroughly cleans the seat of operation with a gauze sponge and normal salt solution.

From Discharges Becoming Subsequently Infected.—The possibility of sterile discharges becoming subsequently septic and causing infection is often a serious question in certain cases, and while the peritoneum does undoubtedly take up a large quantity of fluid, and thus obviates the necessity for drainage in many instances, yet we must not forget that its absorptive power may be greatly diminished by injuries or that the amount of fluid may be so great that it becomes infected before absorption occurs. To guard against the likelihood of these discharges becoming septic requires not only perfect antiseptic methods, but also thorough hemostasis in order to prevent the subsequent accumulation of an excessive amount of blood or serum. The seat of operation should, therefore, be made as dry as possible before closing the abdomen by ligating all bleeding vessels and controlling the oozing which often takes place from more or less extensive areas of denudation as well as by carefully sponging away all fluids that have settled in the pelvic pouches. The amount of blood or serum which may be trusted to the absorptive power of the peritoneum cannot be determined with accuracy, and the problem therefore must be settled in each case by the individual experience of the operator and his knowledge of the probable effects of the traumatic conditions present. Large areas of denudation, even when entirely dry at the time of closing the abdomen, may subsequently be the seat of free capillary oozing, and a large amount of blood and serum be poured out. Again, if the intestines are exposed or roughly handled, serous oozing is likely to occur and add to the quantity of fluid discharged into the pelvic cavity. Furthermore, we must take into consideration that if

there are large denuded areas in the pelvis, the fluids which gravitate into the culdesac of Douglas are very slowly absorbed, and are therefore likely to become infected from close contact with the rectum, the walls of which may or may not be injured. And, finally, injuries of the intestinal walls, while they may not be severe enough to cause leakage, may, however, permit micro organisms to escape from the bowel and infect the retained fluids. It is, therefore, evident that the necessity for drainage is minimized if the surgeon is careful to repair all intestinal injuries and to cover, so far as possible, all denuded surfaces with peritoneum. It is obvious, from what has been said, that drainage is indicated in these cases when a large amount of capillary oozing is likely to occur and when the pelvis is extensively denuded or the intestinal walls injured if there is danger of the retained fluids becoming infected by the passage of septic organisms. The use of drainage under these conditions not only assists the peritoneum in carrying off the discharges, but it also lessens the oozing by keeping the seat of operation dry and stimulating the capillaries to contract.

From Infected Tissues Which Cannot be Removed.—Drainage is always indicated whenever it is impossible to remove all the infected structures at the time of operation. Thus, in cases of circumscribed pelvic abscesses in which the pus is enclosed by the walls of the pelvis and the intestines it is obviously impossible to get rid of the diseased structures and leave an aseptic field. The same conditions are also present when the intestine is adherent to a tubal or ovarian abscess and when the purulent collection is situated between the folds of the broad ligament. An incomplete operation is a comparatively rare occurrence among the best operators at the present day, and, as a rule, ulcerated or necrotic conditions of the intestinal walls can be thoroughly removed by excision, thus doing away with the necessity for drainage in this class of cases.

From Injuries of the Hollow Viscera.—Drainage is occasionally required in injuries of the intestine, the bladder, or the ureters as a precautionary measure in case of leakage. The modern technic in the management of these traumatisms, however, is so nearly perfect that the danger of the escape of the visceral contents is reduced to a minimum, and hence drainage is seldom indicated.

To Watch for Secondary Hemorrhage.—This indication for the use of drainage is very seldom met at the present day, although in former times, when the operative technic of abdominal and pelvic operations had not been perfected and the occurrence of secondary hemorrhages was not uncommon, a glass tube was often inserted into the pelvic cavity for twenty-four or thirty-six hours to enable the surgeon to recognize the onset of bleeding.

Different Forms of Drainage.—The abdominal and pelvic cavities can be drained by the following means: (1) Glass tubes; (2) gauze; (3) rubber tubes.

Glass Tubes.

Indications.—A glass tube is preferable to other forms of drainage when the operation is performed through the abdomen, as there is less danger of infection by this route and the tube can be cared for more conveniently than when it passes from the culdesac of Douglas into the vagina. In the majority of cases glass drainage is employed alone, but in some instances, owing to persistent oozing or to the necessity for walling off the general peritoneal cavity from a focus of infection, it is combined with narrow strips of gauze, which are packed around the tube and their free ends carried out through the abdominal incision (Fig. 813).

Objections.—Notwithstanding the objections that have been made to the use of the glass drainage-tube by some operators the fact remains that it is

the best form of drainage we have at our command to meet the indications in the majority of cases where the operation is performed through the abdomen. As will be more fully explained later on, the capillary action of gauze cannot accomplish the same results as tubular drainage, and comparing the disadvantages of the two methods, it will be found that the latter is the preferable means to employ. In order, however, that glass tubes or other forms of drainage may not be unnecessarily employed, and that the operator may have a clear conception of the dangers which confront him when the abdominal wound is not completely closed at the time of operation, as well as being able to appreciate the necessity for the most thorough and painstaking antiseptic care of the open wound, it would seem important that I should briefly refer to the dangers of tubular drainage.

The most important of these objections may be summarized as follows: (*a*) The entrance of infection through the tube; (*b*) the increased chances of post-operative ventral hernia; (*c*) the possibility of the formation of a permanent

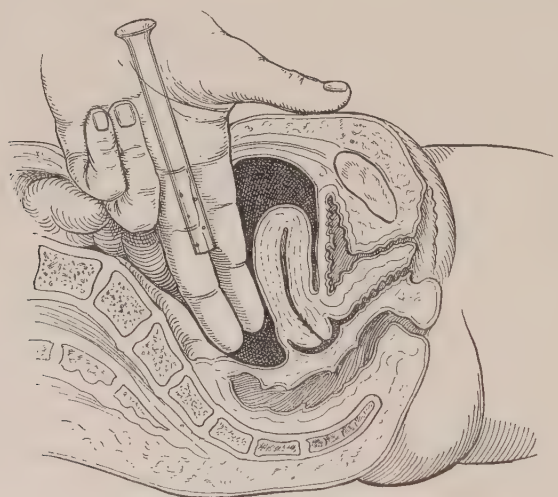


FIG. 808.—INTRODUCTION OF A GLASS DRAINAGE-TUBE INTO THE PELVIC CAVITY.
Shows the tube being guided by the index and middle fingers into the culdesac of Douglas.

fistula; (*d*) the development of a fecal sinus from pressure of the tube upon the rectum; (*e*) the occurrence of intestinal obstruction from adhesions forming around the tube and kinking the bowel.

Introduction of the Tube.—The tube must be long enough to reach the most dependent part of the pouch to be drained. In most instances the tube is placed in the culdesac of Douglas and the posterior wall of the uterus rests upon it. In others, however, the enucleation of a mass may result in the formation of a deeper pouch on either side of the median line, and the end of the tube must be placed in it to secure complete drainage. When through-and-through sutures are used to close the wound, the drainage-tube is not inserted until they are introduced and ready to tie. The tube is usually placed in the lower angle of the wound between the second and third sutures, but it may be necessary in some cases to insert it higher up on account of the position of the pouch to be drained and the situation of inflammatory exudates. In introducing the tube its end should be guided by the index and middle fingers in order that it may be

placed in the proper position and rest in the most dependent portion of the pouch. After the tube is placed in position the fascia above and below is united with a continuous catgut suture before the through-and-through sutures are tied.

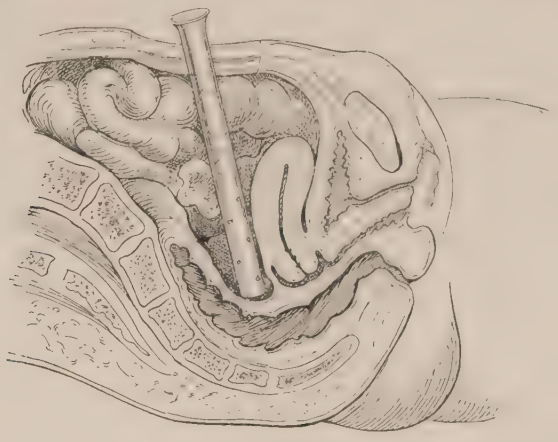


FIG. 809.—INTRODUCTION OF A GLASS DRAINAGE-TUBE INTO THE PELVIC CAVITY.
Shows the end of the tube in the culdesac of Douglas. Note the crowding of the intestines around the tube.

Dressing the Wound.—After the sutures are tied the wound and the surrounding skin are cleansed in the usual manner and the drainage-tube sucked dry with a long rubber syringe (see p. 898, Fig. 811). A compress of gauze wet

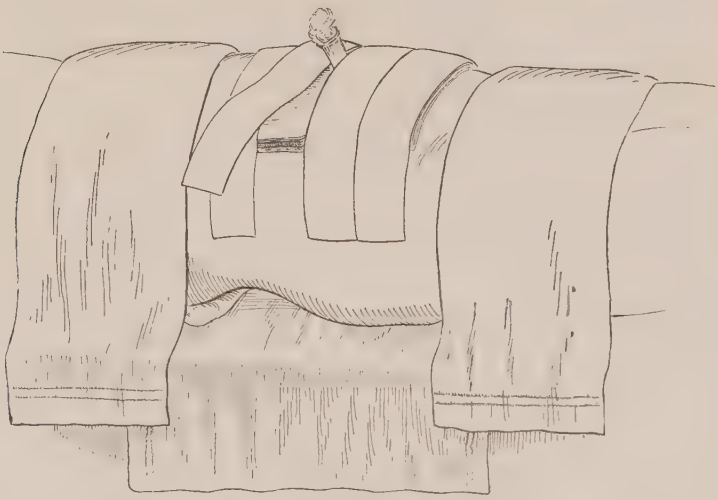


FIG. 810.—DRESSING AN ABDOMINAL WOUND WHEN GLASS DRAINAGE IS EMPLOYED.
Shows the tube projecting through the dressings and plugged with cotton batting. The last strip of adhesive plaster is being applied to the side of the abdomen.

with a solution of corrosive sublimate (1 to 1000) is then placed over the wound and the usual section dressings applied (see p. 827), which are held in position by strips of adhesive plaster. The tube is again sucked dry and its mouth

plugged with cotton batting. A large gauze compress is then placed over the tube and the dressings and a sterile towel laid over all. In lifting the patient from the operating table to the stretcher, and again onto the bed, care must be exercised not to disturb the position of the tube, otherwise its end may become dislodged and thorough drainage be prevented. This is guarded against by keeping the patient's body perfectly straight when she is being lifted and by the nurse placing her fingers over the dressings to steady and support the tube.

Cleaning the Tube.—The dangers of general or local infection should always be borne in mind when cleaning a drainage-tube, and every precaution must be taken to prevent such an accident occurring. General peritonitis is likely to develop if septic organisms gain entrance during the first twenty-four

FIG. 811.—CLEANING A DRAINAGE-TUBE.
Shows the secretions being sucked out of the tube with a long syringe. Note the position of the hands and arrangement of the bedclothes and the area around the dressings.

hours, but after that time there is but little danger of it occurring, and if infection does take place it is usually limited to the tube tract itself or the ligatures in its immediate vicinity.

The antiseptic precautions in cleaning the tube consist in (*a*) the care of the syringe; (*b*) the sterilization of the hands; (*c*) the arrangement of the bedclothes and the area around the tube; (*d*) the act of withdrawing the fluid from the tube; (*e*) the application of fresh dressings.

Care of the Syringe.—The syringe is kept immersed in a 5 per cent. solution of formalin contained in a tray which should be covered with a sterile towel. When it is required for use, it is taken out of the tray and the formalin solution forced out of the barrel. The syringe is then rinsed in hot sterile water contained

in an enameled pitcher and its barrel cleaned by sucking up and ejecting the water several times. The syringe is then ready for use, and after the drainage-tube has been cleaned it is again thoroughly washed in hot sterile water and placed in the tray after filling its barrel with the formalin solution.

Sterilization of the Hands.—The same care must be exercised in preparing the hands before cleansing the tube as for an operation, and hence they must be mechanically sterilized (see p. 814) every time the drainage is withdrawn.

Arrangement of the Bedclothes and the Area Around the Dressings.—A special nurse or an assistant should arrange the bedclothes and the area surrounding the dressings. The sheet and blanket are neatly folded over across the thighs just below the pubes and the nightgown is drawn up so as to completely expose the dressings. Sterile towels are then placed over the chest and the upper part of the abdomen and also over the bedclothes below (Fig. 811).

Withdrawing the Fluid from the Tube.—The cotton plug is removed from the tube and its rim and lumen for a distance of half an inch are wiped with a pledget of absorbent cotton wet with a solution of corrosive sublimate (1 to 1000); care must be taken not to allow any of the chemical to drip into the pelvic cavity. The nozzle of the syringe is then passed to the bottom of the tube and the fluid withdrawn. This should be repeated until the tube is perfectly dry and no more fluid can be sucked into the barrel of the syringe.

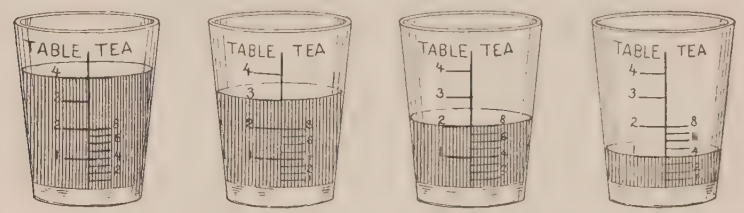


FIG. 812.—DIAGRAM SHOWING THE METHOD OF COLLECTING THE DRAINAGE IN MEDICINE GLASSES. Shows how readily the surgeon can estimate the amount and character of the drainage.

Each time the tube is cleaned the drainage should be collected in a graduated medicine glass and a record kept of the amount of fluid withdrawn and of the hour that the tube was emptied. The glasses are set aside until the surgeon makes his visit, when they are cleaned and used again in the same way. By this method the surgeon is able to see at a glance the increase or decrease in the amount of drainage, and at the same time estimate the changes which take place in its character.

In introducing the nozzle of the syringe into the tube care should be taken not to touch the flange or the inside of the tube, otherwise septic germs may be carried down into the pelvis. When the nozzle touches the bottom of the tube, it should be withdrawn about one-eighth of an inch before suction is applied in order to prevent the tissues being drawn into the syringe and injured. Sometimes thick tenacious material or blood-clots are sucked into the nozzle of the syringe and the discharge prevented from being drawn up. When this occurs, the syringe should be withdrawn and the tenacious matter forced out of the nozzle by pushing the piston down into the barrel.

A syringe with a short nozzle to which a piece of rubber tubing is attached should never be employed for the purpose of cleaning a glass drainage-tube, as such an apparatus increases the dangers of infection by striking the rim and sides of the tube when it is introduced.

Application of Fresh Dressings.—So soon as the tube is perfectly dry its mouth is plugged with sterile cotton batting and a fresh gauze compress and towel are placed over the dressings. In cases in which the patient is nervous or restless and there is danger of the compress and towel being displaced I usually make them secure with two or three strips of adhesive plaster.

When to Clean the Tube.—The frequency with which the tube should be cleaned depends upon the nature of the case and the rapidity with which the fluid accumulates. In cases in which there is considerable oozing the tube should be emptied every fifteen minutes or half-hour in the beginning, and as the discharge lessens in quantity the intervals are gradually lengthened until from three to six hours or even twelve hours intervene between each time the fluid is withdrawn. The tube should never be allowed to overflow, and hence it should be cleaned before it becomes filled with the discharge. In cases of free capillary bleeding if the tube is frequently cleaned and kept dry the hemorrhage is more quickly arrested than when the blood is allowed to accumulate, and hence under these conditions the tube should be emptied at short intervals.

When to Withdraw the Tube.—The time of the withdrawal of the tube depends upon the character and quantity of the discharge and upon the danger of leakage occurring in cases of injury to the intestine, the ureters, or the bladder. In ordinary cases the tube should be removed when the discharge becomes serous in character and not more than one drachm accumulates in four or five hours. In cases in which fecal or urinary leakage is feared the tube should not be taken out for at least three or four days, even when the discharge becomes serous in character and slight in amount. In suppurative cases drainage should be continued for at least one week, or until the quantity of pus is decidedly lessened and the adhesions around the tube are well organized.

In cases of simple oozing the tube is usually withdrawn during the first twenty-four or thirty-six hours after the operation.

Method of Withdrawing the Tube.—The tube is first cleaned and emptied in the manner described above and its rim then grasped between the thumb and the index-finger. A rotatory motion is now given to the tube while gentle traction is exerted and it is gradually withdrawn through the abdominal opening.

Care of the Sinus Tract.—The dressings are removed after taking out the tube and the abdominal wound cleaned with hydrogen peroxide, followed by a solution of corrosive sublimate (1 to 1000). Fresh dressings are then applied, and subsequently renewed every day until the sinus closes, which is generally within one or two weeks in simple non-infected cases. When, however, the drainage is purulent in character the sinus tract should be irrigated twice daily with hydrogen peroxid and the dressings renewed as often as necessary. Suppurative conditions of the sinus tract are apt to become chronic and result in the formation of a permanent fistula (see p. 878).

The sinus tract should always be allowed to contract spontaneously and under no circumstances should rubber tubing be inserted after the glass tube is withdrawn. This is done by some operators under the mistaken idea that the sinus tract cannot take care of itself and that the subsequent drainage will not escape. The adhesions which form around the glass tube before it is withdrawn are sufficiently strong to safeguard the peritoneal cavity without the aid of rubber tubing, and its use is therefore not only unnecessary, but likely to cause infection of a previously sterile sinus.

Gauze.

Indications.—The chief indications for the use of gauze in the abdominal or pelvic cavity are to wall off septic foci from the general peritoneum and to control excessive oozing or bleeding. The so-called capillary action of gauze is very misleading, and it must be remembered that the material itself is practically worthless for the purpose of drainage. It is true that during the first few hours a certain amount of thin fluid or serum is drained away, but in a very short time the meshes of the gauze become clogged with coagulated blood and thick tenacious serum, which check all capillary action and obstruct the escape of the discharges. In other words, a gauze packing soon acts as an obstruction and the discharges are pent up until it is removed. This naturally favors the burrowing of pus and the absorption of septic material by the blood. It is therefore evident that when gauze is employed to shut off a septic focus or to control bleeding, it should be combined with tubular drainage, either in the form of glass or rubber. The latter should be used with gauze packing when

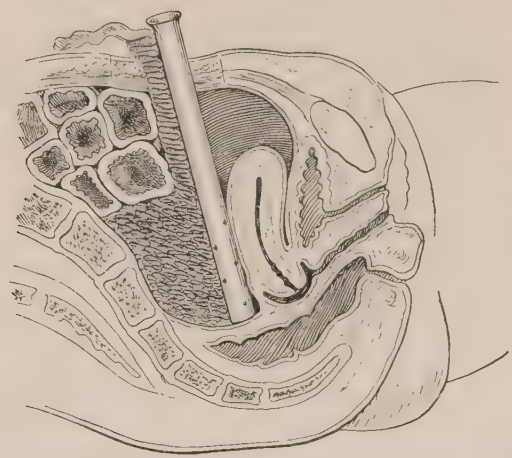


Fig. 813.—Introduction of Gauze and Glass Drainage into the Pelvic Cavity through an Abdominal Incision (page 902).

an operation is performed through the vagina, but when the abdomen is opened, a glass tube is preferable except in certain cases in which the flexibility of the rubber is an advantage.

Objections.—The difficulty of removing a gauze packing is one of the points raised against its use in the abdominal or pelvic cavity, and a number of devices have been employed to overcome this objection. Among these may be mentioned the drain of Mikulicz, which consists of a gauze bag in which strips of gauze are packed and the rubber tissue covering employed by Penrose. Both these devices, however, are of but little practical value, as they prevent the gauze from being packed at the seat of operation in a way to meet the indications, and, besides, they are intended to be used without combining tubular drainage, which, as we have seen above, is an improper method to employ. There is no difficulty whatever in removing a gauze packing from the peritoneal cavity if it has been properly applied and sufficient time is allowed to elapse before making the attempt. Gauze acts as an irritant to the surrounding peritoneum, and within a

few hours the field of operation is shut off from the general cavity by a wall of inflammatory lymph. In the beginning the union between the lymph and the gauze is very intimate and strong and the packing is firmly adherent. In the course of two or three days, however, a slight suppurative process takes place and this union is weakened, rendering the removal of the gauze a very simple matter.

Introduction.—The gauze should not be inserted until the abdominal sutures are introduced and the drainage-tube is in position. A long strip of gauze 6 or 8 inches wide is then passed through the abdominal opening and carried to the bottom of the pelvis. It is then packed in layers around the drainage-tube until the septic foci or the bleeding cavities are thoroughly filled and the general peritoneal cavity shut off. The end of the strip is then brought out of the abdominal opening either above or below the tube and the wound closed in the usual manner (Fig. 813).

In cases of vaginal section in which drainage is made through the vault of the vagina a rubber tube is first introduced into the cavity to be shut off from the general peritoneum and a strip of gauze 6 or 8 inches wide packed around it.

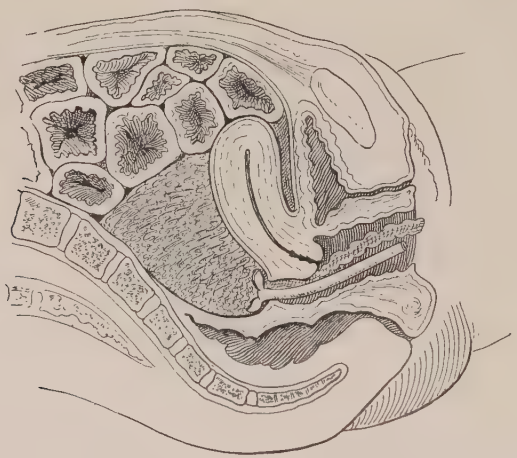


FIG. 814.—INTRODUCTION OF GAUZE AND RUBBER DRAINAGE INTO THE PELVIC CAVITY THROUGH A VAGINAL INCISION.

Dressing the Wound.—After the abdominal sutures are tied and the wound cleaned in the usual manner the same dressings are applied as when a glass tube is used alone.

When rubber tubing is combined with gauze packing after an abdominal section a large compress, consisting of gauze and absorbent cotton, is placed directly over the abdomen to absorb the discharges and serve as a dressing to the wound.

In cases in which gauze packing and rubber tubing are employed after a vaginal section the vagina is packed with a gauze tampon and the vulva protected with a compress secured with a T-bandage.

Subsequent Care of the Wound.—If glass drainage is used with gauze packing the tube is cleaned in the same manner as when it is employed alone and the usual dressings applied. The gauze and the tube should be removed in two or three days and the abdominal wound cleaned with hydrogen peroxid, followed by a solution of corrosive sublimate (1 to 1000). A rubber tube is then placed

in the bottom of the wound and kept from slipping into the opening by attaching a safety-pin to its proximal end. Fresh dressings, consisting of gauze and absorbent cotton, are then applied directly over the wound and secured by strips of zinc oxid plaster. The dressings are removed every day and the cavity irrigated through the tube with hydrogen peroxid, using a short-nozzled glass or rubber syringe for the purpose. The tube should be withdrawn in the course of three or four days when the cavity begins to contract, and the opening allowed to heal spontaneously. If, however, the drainage is purulent in character, the sinus should be irrigated twice a day with hydrogen peroxid and the dressings renewed as often as required.

When rubber tubing and gauze packing are used after an abdominal section

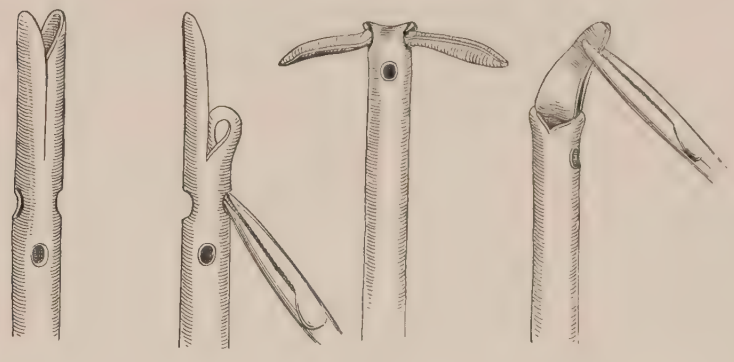


Fig. 815. Fig. 816. Fig. 817. Fig. 818.

Method of Making Reed's Rubber T Drainage-tubes.

Fig. 815 shows a piece of rubber tubing cut oval at its end and split for a distance of an inch and a half into two flaps; a small hole is cut on each side of the tube below the base of each flap; Fig. 816 shows one of the flaps being drawn through the hole at its base; Fig. 817 shows the formation of a T drainage-tube; Fig. 818 shows the method of introducing the tube into a cavity.

they are usually withdrawn in two or three days, and in the meantime nothing is required but a frequent change of dressings.

In cases in which a rubber tube and gauze are employed after a vaginal section they are generally withdrawn on the second or third day and the cavity either loosely packed with fresh gauze or a rubber T-drain is inserted and held in position by a vaginal tampon. If gauze is employed, the packing should be removed daily; the wound irrigated with warm sterile water or a solution of boric acid; and the vulva protected by a compress. The irrigation and the packing are continued until the sinus contracts and the wound heals. If a rubber T-drain is used, it should remain in place until the cavity is well contracted, and in the meantime the wound should be irrigated every day with warm sterile water or boric acid solution.

Rubber Tubes.

Rubber drainage may be used alone or combined with gauze. If the seat of operation is walled off from the general peritoneal cavity, a T drainage-tube may be used alone, and it is especially indicated under these circumstances to drain an abscess cavity through the vaginal vault or an abdominal incision. Combined with gauze packing it is frequently employed in cases of appendicitis, vaginal section, and after an abdominal operation when the patient cannot be controlled and there is danger of a glass tube breaking.

CLOSING THE ABDOMINAL WOUND.

In suturing the incision the layers of the abdominal wall, especially the fascia anterior to the recti muscles, must be accurately approximated and no dead spaces left. Imperfect union between the edges of the wound is a common cause of post-operative ventral hernia, and suppuration is frequently due to the accumulation of blood in dead spaces.

Method.—The wound is closed by introducing a series of through-and-through silkworm-gut sutures and uniting the edges of the fascia with a continuous suture of catgut.

Needles and Sutures.—The through-and-through sutures are introduced with a straight triangular pointed needle, $2\frac{3}{4}$ inches long, which is held in the fingers and passed through all the layers of the abdominal wall, including the skin and the peritoneum. The silkworm-gut should be of medium thickness and the strands from 13 to 15 inches long.

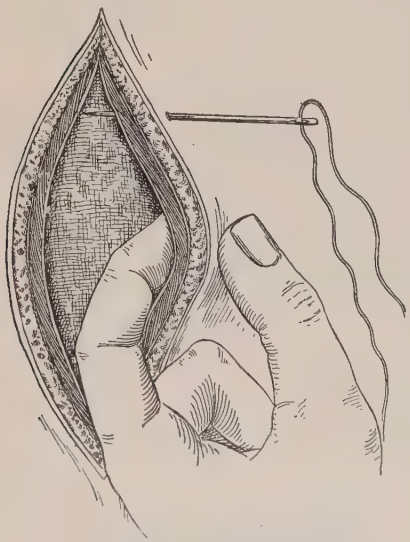


FIG. 819.—CLOSING THE ABDOMINAL WOUND. Showing the method of introducing the through-and-through sutures.

The continuous suture uniting the fascia is introduced with a small full-curved Hagedorn needle. Plain cumol catgut No. 2 is used for this suture.

Technic.—The patient is placed at an angle of 20 degrees in order to cause the intestines to fall backward toward the diaphragm and a gauze pad is spread out in the abdominal cavity immediately beneath the incision to protect the viscera and collect any blood that may ooze from the suture tracts. The through-and-through sutures are then introduced. Beginning at the lower angle of the wound they are placed about $\frac{1}{4}$ to $\frac{1}{3}$ of an inch apart and include all the layers of the abdominal wall. In introducing these sutures the operator holds the wall of the abdomen between the thumb and the index-finger of the left hand and passes the needle through the skin about $\frac{1}{4}$ of an inch from the edge of the wound. As the needle passes through the abdominal wall it is made to take an outward course until its point reaches the subperitoneal fatty tissue, when it is directed inward and finally pierces the peritoneum about $\frac{1}{4}$ of an inch from the edge of the incision. The opposite side of the wound is then grasped by the thumb and the finger and the needle passed in reverse order, emerging on the skin close to the edge of the incision. After all the sutures have been introduced the free ends on each side are grasped with a pair of hemostatic forceps and placed flat on the abdomen out of the way (Figs. 819 and 820).

The gauze pad and the temporary packing in the pelvic pouches (culdesac of Douglas and vesico-uterine space) are then removed and the omentum drawn down under the incision. Upward traction is then made with the free ends of the sutures to approximate the lips of the wound and bring the peritoneal surfaces together.

A continuous suture of catgut is now introduced and the edges of the aponeurotic fascia united.

The wound is finally closed by tying the through-and-through sutures. Before each suture is tied traction should be made upward with its free ends to take out the slack and bring the peritoneal surfaces in close apposition.

Fat Belly Wall.—Suppuration is especially liable to occur in a fat belly wall on account of the low vitality of the subcutaneous fatty tissue and the danger of leaving dead spaces in which blood may accumulate and subsequently become

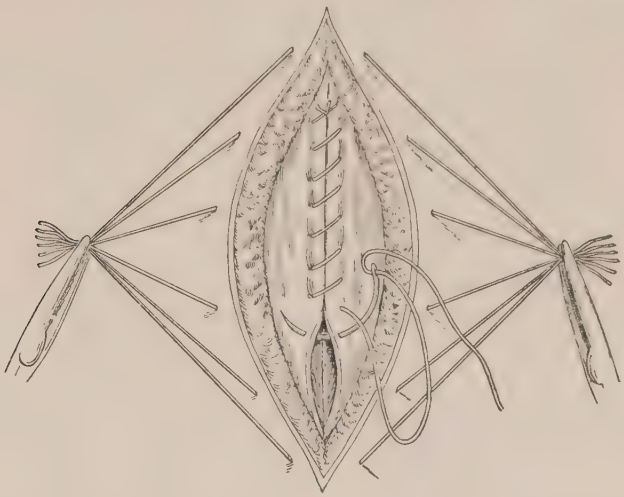


FIG. 820.—CLOSING THE ABDOMINAL WOUND.
Shows the continuous suture of catgut being introduced to unite the aponeurotic fascia.

infected. To guard against this accident the wound above the aponeurotic fascia which is closed by a continuous suture of catgut is drained with a few strands of silkworm-gut that are placed over the fascia and their free ends brought out at the upper and lower angles of the incision. The through-and-through sutures are then tied and the wound dressed in the usual manner. At the end of forty-eight hours the silkworm-gut drain is removed and fresh dressings applied to the wound.

DRESSING THE WOUND.

The through-and-through sutures are tied and their free ends cut off within one inch of the surface of the abdomen. The wound and the adjacent skin are then sponged with sterile water and thoroughly dried. A large gauze pad wet with a solution of corrosive sublimate (1 to 1000) is now laid over the wound and the abdominal dressings applied. These consist of two large gauze pads and a thick layer of absorbent cotton, which are made into a compress and placed over the wound. The dressings are secured with four strips of adhesive (Z. O.) plaster and a sterile towel laid over all.

The adhesive strips should be 2½ inches wide and long enough to give a firm support to the abdominal walls when they are applied over the dressings.

I have employed this method of dressing the wound with uniformly good results for several years, and consider it a decided improvement over the old fashioned flannel or many tailed bandages so commonly employed. It is per

manent, does not become soiled or loose, and leaves the patient's back and buttocks perfectly free. Again, the wound can be readily inspected without irritating the skin by cutting the strips on one side and lifting up the dressings. Fresh strips can then be fastened over the old ones and the dressings made secure

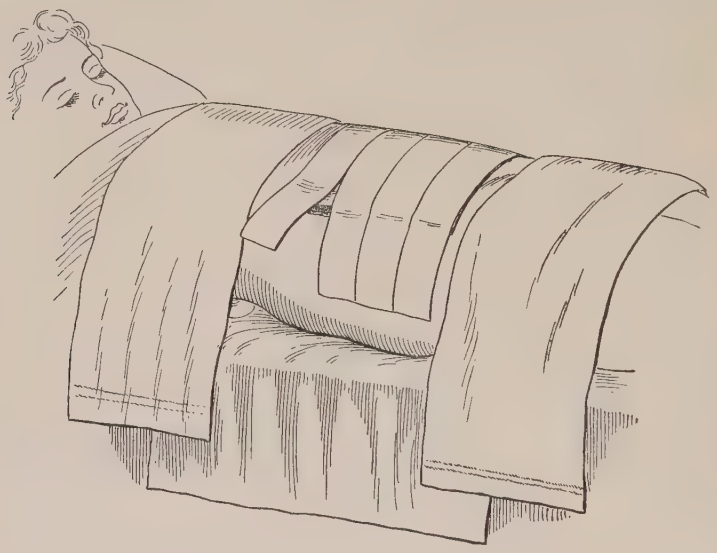


FIG. 821.—DRESSING THE ABDOMINAL WOUND.
Shows the dressings in position and the fourth strip of adhesive plaster being attached to the side of the abdomen.

again. The ordinary bandage is a cumbersome contrivance and not adapted to keep the dressings in the best condition. It soon becomes loose and slips up the patient's back, and always becomes soiled when the bowels are moved or a rectal enema is given.

ENTEROCLYSIS.

Before removing the patient from the operating table a quart of normal salt solution (110° F.) is injected high in the rectum for its stimulating effect and to lessen post-operative thirst.

THREADING NEEDLES.

Being accustomed to operate without an assistant to thread needles, and not using a suture-carrier in my technic on account of it making a larger hole than necessary, I have employed a different method than usual in order not to waste time and delay the operation. A silk ligature is always wet and limp and its end more or less unraveled, making it extremely difficult to pass through the eye of a needle. Even when the end is cut at an angle the fibers do not adhere closely, and become frayed so soon as an attempt is made to thread the needle. To overcome this difficulty, I have a small alcohol lamp burning on the instrument table, and when it is necessary to thread a needle the end of the ligature for a distance of one inch is passed slowly through the flame. The heat quickly dries this portion of the ligature and makes it quite stiff. The extreme end of the ligature is then held in the flame until it chars black, when it is withdrawn

and the char stripped off with the fingers, leaving a hard, sharp, symmetrically pointed tip which can be easily passed through the needle.

Having prepared the end of the ligature in this way, the threading is accomplished as follows: The needle is held firmly between the second and third

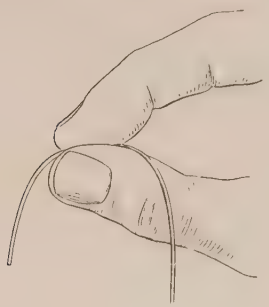


FIG. 822.

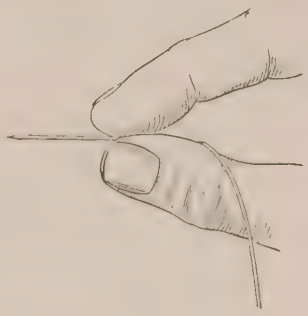


FIG. 823.

ASHTON'S METHOD OF THREADING NEEDLES.

Fig. 822 shows a limp wet silk ligature; Fig. 823 shows the same ligature after it has been passed through an alcohol flame and its tip charred. Note the stiffness of the ligature and its sharp pointed end.

joints of the ring-finger and the little finger of the left hand and the ligature passed through the eye as usual by the fingers of the right hand. The thumb and the index-finger of the left hand, being free, grasp the end of the ligature so soon as it penetrates the eye and draw it completely through. The advantage gained by this little maneuver is that the end of the ligature is secured so soon

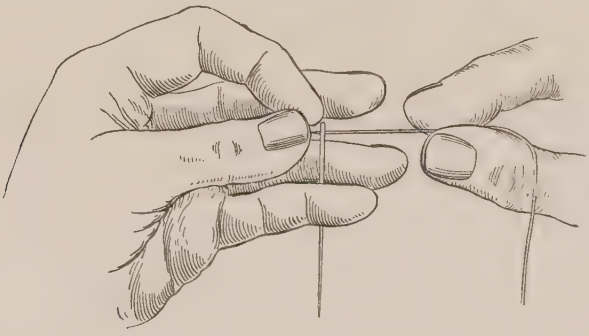


FIG. 824.—ASHTON'S METHOD OF THREADING NEEDLES.

Shows the needle held between the ring and little fingers while the ligature is being passed through its eye and secured by the thumb and index-finger.

as it penetrates the eye of the needle and prevented from slipping back. In threading a needle in the ordinary way the ligature very often slips out of the eye by its own weight when the fingers that hold it are removed to secure its tip.

OPERATIVE COMPLICATIONS.

The complications which may arise during an abdominal or pelvic operation cannot always be determined beforehand, and the surgeon must therefore

be prepared to meet them. It may be that a vessel is torn low down in the pelvis, or the intestine or the bladder is injured; or, again, the diagnosis may have been wide of the mark and the lesion found to be situated in an organ that was not suspected of being the seat of disease. It is a matter of but little importance what complications arise, provided the surgeon has a practical and thorough knowledge of abdominal and pelvic surgery; but if, for instance, he simply knows how to remove a small mass from the pelvis and is ignorant of the operative technic for repairing an injury to a neighboring organ, he will eventually add to an already long list of so-called "unavoidable deaths."

The complications met in operations upon the pelvic organs may be classified as follows:

1. Accidents in opening the abdomen.
   - (*a*) Hemorrhage.
   - (*b*) Peeling off the parietal peritoneum.
   - (*c*) Injuries of the bladder.
   - (*d*) Wounding the intestine or an underlying growth.
2. Vomiting and contraction of the abdominal walls.
3. Escape of the viscera through the abdominal incision.
4. Adhesions.
5. Hemorrhage.
6. Wounds of the bladder.
7. Wounds of the ureters.
8. Injuries of the intestines.

ACCIDENTS IN OPENING THE ABDOMEN.

Hemorrhage.—There is rarely sufficient bleeding in opening the abdomen to necessitate the use of hemostatic forceps or ligatures. Under ordinary circumstances, therefore, the abdomen is opened without delay. If, however, the bleeding is free, the vessels should be caught with hemostatic forceps, without including the surrounding tissues in their grasp, and if necessary ligated with catgut.

Peeling Off the Parietal Peritoneum.—This accident may occur in the earlier work of an operator when the union between the peritoneum and the abdominal wall is very loose and is easily separated, under the impression that adhesions are being dealt with. Again, the same accident may occur when a large abdominal tumor is adherent to the anterior parietal peritoneum and its enucleation attempted before the abdomen is actually opened.

If a small strip of peritoneum is peeled off in the neighborhood of the incision it need cause no concern whatever, as it is readily held in place by the sutures which close the abdominal wound. An extensive separation of the peritoneum, however, requires special suturing, otherwise a dead space will be left in which blood is likely to accumulate and become infected. The peritoneum under these circumstances should be reattached to the overlying structures of the abdominal wall by a series of continuous catgut sutures which are applied in the same manner as when one piece of cloth is basted upon another.

Injuries of the Bladder.—The bladder in an adult, when empty or not displaced by a subperitoneal growth, is entirely a pelvic organ, while in a child, prior to puberty, it lies partly within the abdominal cavity. The lower angle of the abdominal incision should therefore be higher in a child than in an adult, or the bladder may be injured when the abdomen is opened.

In large anterior intraligamentous tumors the bladder may be drawn up as high as the umbilicus or even higher, and unless the abdomen is carefully

opened an injury to the organ is certain to result. In all cases when in doubt as to the position of the bladder the introduction of a sound will at once settle the question (Fig. 976).

Wounding the Intestine or an Underlying Growth.—There is always danger of this accident occurring in cases in which the parietal peritoneum has become adherent to the abdominal contents. While making the incision through the belly wall much may be learned as to the probable presence of these abnormal fixations. Thus, an injected appearance of the connective tissue and the subperitoneal fat indicates adhesions or a thickened peritoneum, and free bleeding from the wound also points to the same condition.

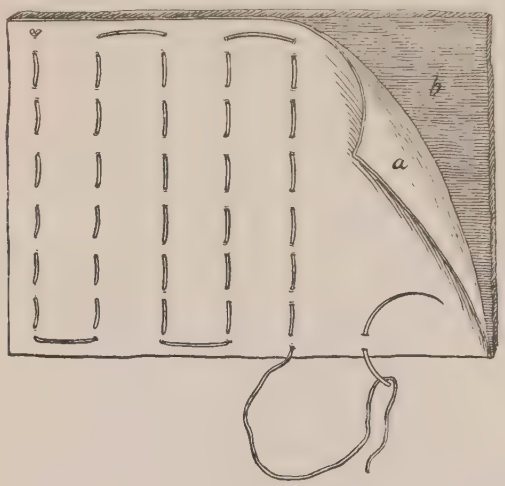


FIG. 825.—PEELING OFF THE PARIETAL PERITONEUM DURING AN OPERATION.
Shows the method of introducing the sutures to reattach the peritoneum.

In cases in which the abdominal wall is greatly distended the peritoneum is usually thinner than normal, and unless the surgeon is very cautious in making the incision the intraperitoneal contents may be injured.

Adherent gut along the line of incision is always to be expected in secondary operations, and the opening through the abdomen should therefore be above or below the original wound.

Injuries to the intraperitoneal contents often occur from recklessness or ignorance upon the part of a surgeon who conceives the false idea that cutting into the abdominal cavity with one sweep of his knife is good surgery and entitles him to be classed as a brilliant operator.

VOMITING AND CONTRACTION OF THE ABDOMINAL WALLS.

These accidents, which are caused by the unskilful administration of the anesthetic, not only result in a serious loss of time during the operation, but they also increase the subsequent danger by forcing the intestines out of the abdomen and exposing them to unnecessary irritation. It is important, therefore, that the anesthetizer should be qualified and have special experience in administering an anesthetic in abdominal operations.

ESCAPE OF THE VISCERA THROUGH THE INCISION.

Protrusion of the intestines or the omentum through the abdominal opening may occur during an operation, and is usually caused by vomiting or contraction of the abdominal muscles. Should the accident occur, the viscera must be replaced at once and prevented from escaping again by holding a large pad over the incision until the cause of the excessive intra-abdominal pressure has been removed. It is often difficult or impossible to return the intestines *en masse*, as they escape as fast as they are replaced or they block up the abdominal opening. No difficulty, however, will be experienced if the coil of intestine

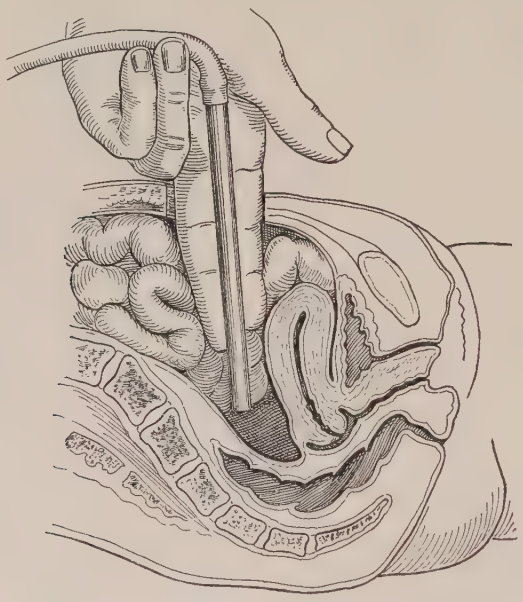


FIG. 826.—SHOWS THE METHOD OF PREVENTING THE ESCAPE OF THE INTESTINES WHEN THE PERITONEAL CAVITY IS FLUSHED.

Note the position of the fingers and the nozzle of the irrigating apparatus.

which escaped last is pushed back first with the fingers of one hand while the fingers of the other hand replace the succeeding segment.

The intestines are always more or less likely to escape when the peritoneal cavity is flushed, and unless precautions are taken at that time, several coils of bowel may be suddenly forced out of the abdominal cavity. The accident can be prevented by passing the index and middle fingers of the left hand into the abdominal cavity and inserting the nozzle of the irrigating apparatus between them.

ADHESIONS.

The presence or absence of adhesions determines the ease and safety with which an abdominal or a pelvic operation can be performed.

For practical purposes adhesions may be classified into those which are *recent* and those which are *chronic*.

Recent Adhesions.—These adhesions are soft, friable, and easily broken up, and are usually met in early operations for acute lesions associated with general or localized peritonitis.

FIG. 827.—SHOWS THE METHOD OF REMOVING ADHESIONS FROM THE SAC OF AN OVARIAN CYST WITH A GAUZE SPONGE.

Recent adhesions can be separated by the fingers or a sponge without any danger of injury to underlying or adjacent structures and without the aid of sight. It is therefore unnecessary to enlarge the abdominal incision in order to inspect the field of operation, as a mass can be enucleated and delivered through a small opening provided the adhesions are friable. A pelvic mass may be enucleated by inserting the tips of the index and middle fingers between it and the adjacent structures and gradually working them in the direction of least resistance until the tumor is entirely free. Omental and intestinal adhesions are easily rubbed off with a gauze sponge from the surface of a large solid tumor, and they are also readily removed in the same manner from the sac of an ovarian cyst as it is delivered through the abdominal opening.

Chronic Adhesions.—These adhesions are firm and well organized and sometimes great skill is required in dealing with them. They are usually found in cases of old or neglected pelvic disease and are often responsible for some of the most difficult operations in pelvic surgery. Again, we meet them in ovarian cysts that have been tapped, in uterine fibroids previously treated by electricity, and also in solid pelvic tumors which have attained a large size.

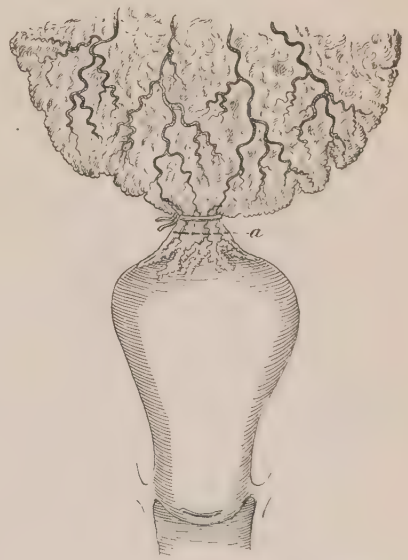


FIG. 828.—SHOWS THE METHOD OF LIGATING AN OMENTAL ADHESION (page 912).

The dotted line *a* indicates the incision separating the adherent portion of the omentum. Note that only a small part of the omentum is adherent.

Old adhesions must be either torn apart with the fingers or divided with scissors and, if necessary, ligated to prevent hemorrhage.

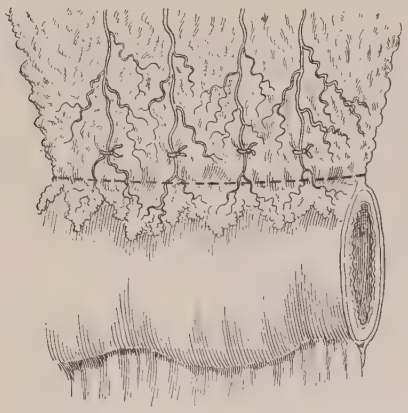


Fig. 829.

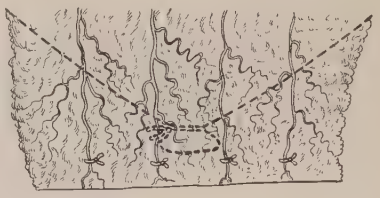


Fig. 830.

The Method of Ligating Extensive Omental Adhesions.

Fig. 829 shows the ligatures applied to the blood-vessels and a dotted line to indicate the incision separating the adherent omentum; Fig. 830 shows the omentum cut away from the intestine; the dotted lines represent the shape the omentum would assume if a single ligature had been employed.

If the omentum is attached to a tumor, a ligature is applied and it is cut away, leaving the adherent portion upon the growth (Fig. 828). The omentum is exceedingly vascular, and a serious hemorrhage may result unless a ligature is used to control the bleeding. When the omentum is extensively adherent it should be ligated in sections and not tied *en masse*. Unless this is done the vessels may not be sufficiently compressed to prevent hemorrhage and the omentum itself will not lie evenly over the intestines on account of its puckered condition.

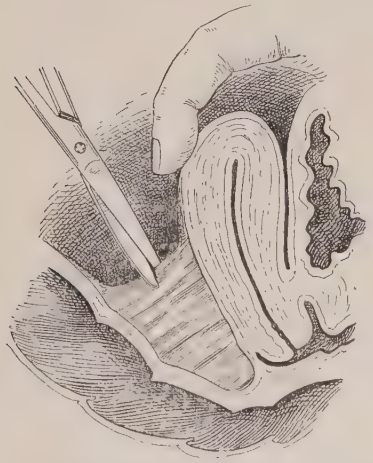


Fig. 831.—The Method of Stretching Adhesions and Cutting them with Scissors.

Note that the adhesions between the rectum and the uterus are put upon the stretch by drawing the fundus forward.

An adhesion existing between a morbid growth and one of the abdominal viscera may be so broad and firm that it will be necessary to leave a portion of the tumor adherent rather than run the risk of causing a serious injury and increasing the dangers of the operation.

Old adhesions should be broken up under direct inspection with the patient in the Trendelenburg position, and the operator should keep as close as possible to the tumor when they are separated with the fingers or cut with scissors. It is often possible to stretch the adhesions between adjacent surfaces and cut through them with a knife or scissors. Thus, for example, when the uterus is adherent to the rectum, if the fundus is

pulled forward the adhesions are drawn taut and can readily be cut without any danger of injuring the bowel.

HEMORRHAGE.

An intraperitoneal hemorrhage may occur from the separation of adhesions during the enucleation of a tumor, from tearing the broad ligaments, and also from an injury to a growth before its pedicle is ligated.

When the accident occurs, the patient's body must be raised at once to an angle of 45 degrees, the bleeding point located, and the hemorrhage controlled by gauze packing or ligatures or both.

Bleeding resulting from adhesions is usually slight and ceases quickly. If, however, the adhesions are extensive and free oozing follows their separation, the bleeding surface should be firmly packed with gauze, which can usually be removed when the operation is finished. Should the oozing still keep up, the field of operation is packed with a strip of gauze and its free end left outside of the abdomen; the packing is generally removed in from twenty-four to forty-eight hours.

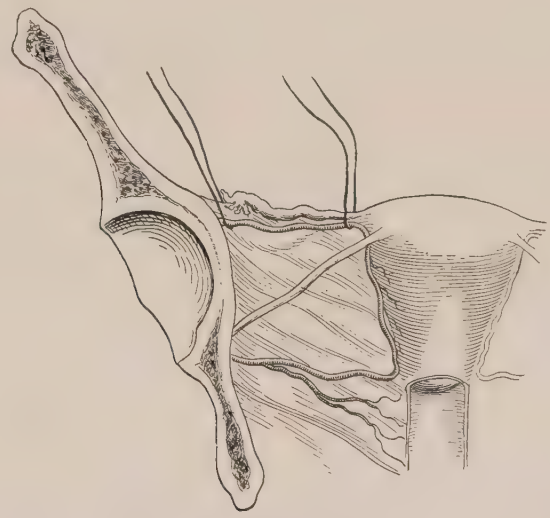


FIG. 832.—THE METHOD OF CONTROLLING A HEMORRHAGE FROM THE BROAD LIGAMENT (page 914). Showing a ligature passed under the uterine and pelvic ends of the ovarian artery.

Hemorrhage occurring from a tumor during its enucleation and delivery need cause no concern, as it ceases so soon as the pedicle is ligated. Sometimes, however, it may be necessary to apply hemostatic forceps to the torn vessels on the surface of the tumor in order to control the loss of blood and keep the field of operation clear.

Shelling out an adherent mass low down in the pelvis may result in serious traumatism, and cases have been reported in which one of the iliac arteries was torn.

One of the most common causes of hemorrhage is rupturing the vascular arch formed by the anastomosis of the ovarian and uterine arteries. These vessels are torn in breaking up adhesions, by making undue tension upon the pedicle, in removing the uterine appendages, and by the ligature cutting into the broad ligament. Should this accident occur, the stump of the pedicle should be brought

at once into view and the upper border of the ligament inspected. The bleeding point is then caught with hemostatic forceps and a second ligature applied. It is important to remember that hemorrhage from any portion of the broad ligament can always be controlled by ligating both its uterine and pelvic ends (Fig. 832).

Sometimes the pedicle may be insecurely tied and a serious hemorrhage result from the ligature slipping. Under these circumstances the upper border of the broad ligament should be seized with hemostatic forceps and fresh ligatures applied to the bleeding vessels.

WOUNDS OF THE BLADDER.

The bladder may be injured in opening the abdomen and in breaking up adhesions.

The wound should be sutured (*cystorrhaphy*) at once and the urine which has escaped into the peritoneal cavity removed with a gauze sponge. Normal urine

FIG. 833.—THE METHOD OF REPAIRING A WOUND OF THE BLADDER INVOLVING ONLY ITS OUTER COATS BY MEANS OF A CONTINUOUS LEMBERT SUTURE (page 915).

The suture is shown (*a*) drawn taut, (*b*) lying loosely in the tissues, and (*c*) being introduced.

causes no irritation of the peritoneum, but if cystitis is present the urinary secretions are likely to produce infection and endanger the life of the patient.

If the wound has been properly sutured, there is no danger of subsequent leakage, and drainage is therefore not indicated. It may be necessary if the tear is large to catheterize the patient every three or four hours for the first day after

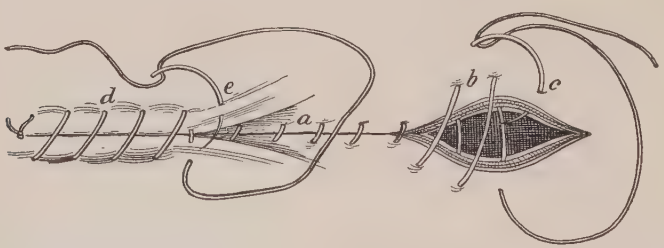


FIG. 834.—THE METHOD OF REPAIRING A WOUND OF THE BLADDER INVOLVING ALL OF ITS COATS BY MEANS OF TWO LAYERS OF SUTURES (page 915).

The first layer is a continuous suture including all the coats of the bladder except the mucous membrane, and is shown (*a*) drawn taut, (*b*) lying loosely in the tissues, and (*c*) being introduced. The second layer is a continuous Lembert suture burying in the first tier and is shown (*d*) drawn taut and (*e*) being introduced.

operation, and then every six hours for the next two days in order to avoid distention and undue strain upon the sutures. A permanent catheter should not be employed, as it is seldom indicated and may cause cystitis.

Operation.—A vesical tear involving only the outer coats of the bladder should be closed by a continuous Lembert suture of No. 2 braided silk, which

is carried upon a curved intestinal needle (see Fig. 843, p. 919) and passed deep enough to include the torn structures.

A deep tear involving all the coats and opening the cavity of the bladder should be closed by two tiers or layers of sutures as follows: The first layer approximates the edges of the wound and the second tier reinforces and buries these sutures, thus guarding against the possibility of leakage. The approximation layer consists of a continuous suture of cumol catgut (No. 1), which is carried upon a curved intestinal needle (see Fig. 843, p. 919) and passed through all the coats of the bladder except the mucous membrane. The reinforcing tier consists of a continuous Lembert suture of No. 2 braided silk which is also carried upon a curved needle and passed through the peritoneum and the superficial portion of the muscular coat of the bladder.

WOUNDS OF THE URETERS.

The ureters have been torn in breaking up adhesions, and they have also been tied with a ligature or pierced by a needle in ligating a bleeding vessel low down on the pelvic floor. In tying off the base of the broad ligaments there is always danger of including one or both of the ureters, and the same accident may happen with a clamp in performing a vaginal hysterectomy.

The treatment of ureteral injuries is discussed on page 675.

INJURIES OF THE INTESTINES.

Classification and Treatment.—An intestinal injury may vary from a superficial wound to a complete destruction of an entire segment of the bowel.

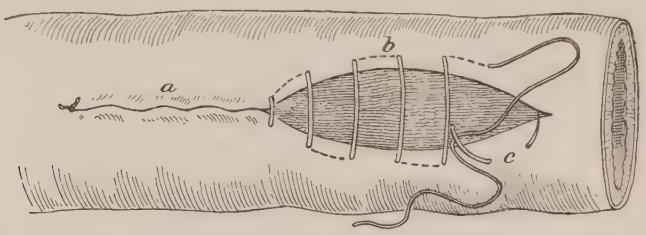


FIG. 835.—THE METHOD OF REPAIRING TEARS OF THE SEROUS AND MUSCULAR COATS OF THE INTESTINE BY MEANS OF CUSHING'S RIGHT-ANGLED SUTURE (page 916).
The suture is shown (*a*) drawn taut, (*b*) lying loosely in the tissues, and (*c*) being introduced.

The following lesions may be met as operative complications of an abdominal section:

1. Tears of the serous and muscular coats.
2. Tears into the lumen of the intestine.
   - (*a*) Longitudinal tears.
   - (*b*) Transverse tears.
   - (*c*) Irregular tears.
   - (*d*) Tears involving loss of tissue.
3. Necrotic areas.
4. Wounds of the mesentery.
5. Injuries of the rectum.

Tears of the Serous and Muscular Coats.—All superficial tears should be sutured in order to guard against the danger of leakage and to cover over the raw surfaces which would otherwise form adhesions with adjacent structures.

These tears should be closed by a continuous Lembert or Cushing's right-angled suture, which should penetrate to the depth of the tear in the muscular coat and bring the serous surfaces in close contact (Fig. 835).

Tears into the Lumen of the Intestine.—Longitudinal Tears.—A short longitudinal tear should be closed by interrupted Lembert sutures or Cushing's right-angled suture (Fig. 836).

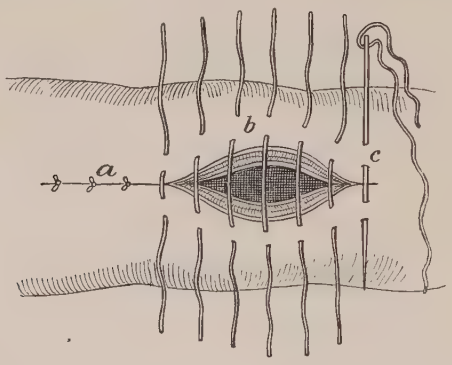


FIG. 836.—THE METHOD OF REPAIRING SHORT LONGITUDINAL TEARS INTO THE LUMEN OF THE INTESTINE BY MEANS OF INTERRUPTED LEMBERT SUTURES.

The sutures are shown (*a*) tied, (*b*) lying loosely in the tissues, and (*c*) being introduced.

A long tear, however, should be repaired by a series of interrupted Lembert sutures, followed by a continuous Lembert or Cushing's right-angled suture, which buries the first row and guards against the danger of leakage (Fig. 837).

Transverse Tears.—Transverse tears should be sutured in the same

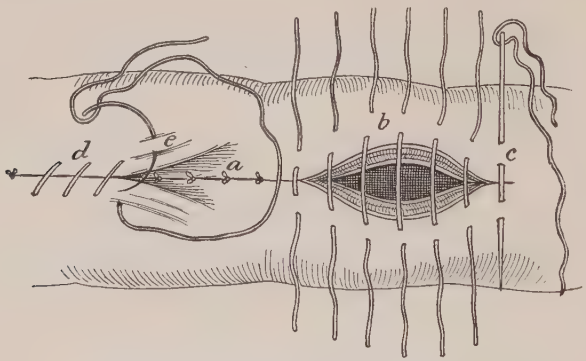


FIG. 837.—THE METHOD OF REPAIRING LONG LONGITUDINAL TEARS INTO THE LUMEN OF THE INTESTINE BY MEANS OF TWO LAYERS OF SUTURES.

The first layer consists of interrupted Lembert sutures and is shown (*a*) tied, (*b*) lying loosely in the tissues, and (*c*) being introduced. The second layer is a continuous Lembert suture burying in the first tier and is shown (*d*) drawn taut and (*e*) being introduced.

manner as longitudinal wounds. A tear which nearly or completely divides the intestine transversely will require an end-to-end anastomosis.

Irregular Tears.—An irregular tear is one in which a longitudinal and a transverse wound are associated and form an injury which opens the lumen of the bowel in two or more directions, as shown in Fig. 838.

When the transverse and diagonal tears are not too long enterorrhaphy is in-

dicated, but if they nearly divide the bowel across, an end-to-end anastomosis should be performed.

In suturing these tears the edges of the transverse wounds should be approximated with interrupted Lembert sutures; the longitudinal wound is then closed in a similar manner; and, finally, if any doubt exists as to the efficiency of the closure, the suturing should be reinforced by a continuous Lembert or Cushing right-angled suture (Fig. 839).

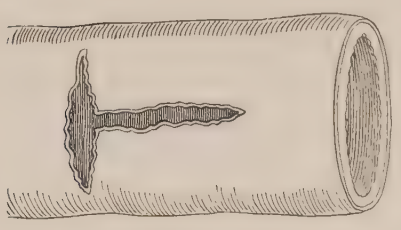


Fig. 838.

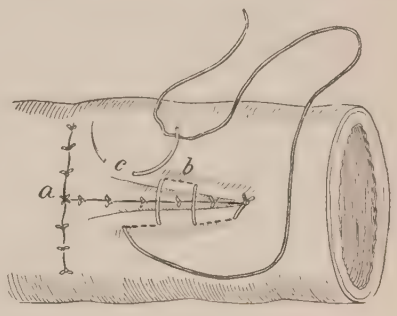


Fig. 839.

The Method of Repairing Irregular Tears of the Intestine.

Fig. 838 shows an irregular tear formed by the joining of a transverse and a longitudinal wound; Fig. 839 shows the method of suturing by means of two layers of sutures: *a* shows the first layer (interrupted Lembert sutures) tied; *b* and *c* show the second layer (Cushing's right-angled suture) being introduced.

Tears Involving Loss of Tissue.—Wounds of the intestine are often associated with more or less loss of tissue, and it is sometimes difficult to decide how they should be repaired. Under these circumstances we must consider the effect of enterorrhaphy upon the caliber of the bowel and avoid reducing it to the extent of causing a decided kink or stricture. Enterorrhaphy is contraindicated if the lumen of the bowel is diminished more than one-half by suturing, and resection followed by anastomosis should therefore be performed.

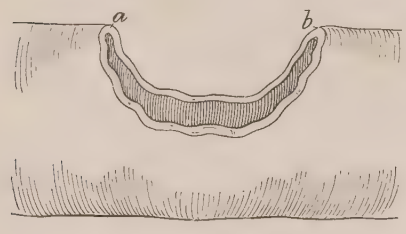


Fig. 840.

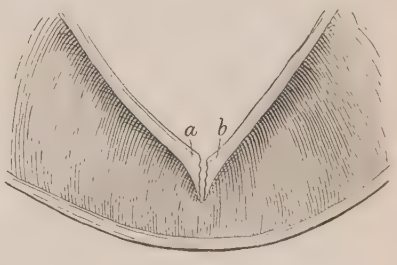


Fig. 841.

Tears of the Intestine Involving Loss of Tissue.

Fig. 840 shows a tear involving an extensive loss of tissue; Fig. 841 shows the effect upon the caliber of the bowel by uniting the edges with sutures (enterorrhaphy). Note that when the edges at *a* and *b* are approximated a decided constriction results.

There is no necessity of trimming the ragged edges of a lacerated tear before suturing, as they are inverted into the lumen of the gut when the wound is closed and do no harm (Figs. 840 and 841).

Necrotic Areas.—When a knuckle of intestine becomes adherent to a pus sac, its walls usually become infected at the point of contact and a necrotic or sloughing area, varying in size, is observed when the adhesions are separated.

The treatment of this lesion depends upon its extent and the condition of the surrounding intestinal walls, which are often infiltrated and so brittle that they will not hold a suture. A small superficial or deep area of necrosis surrounded by healthy tissues should be lightly cureted with a scalpel and turned into the lumen of the gut by interrupted mattress or Lembert sutures, which may, if necessary, be reinforced by Cushing's right-angled suture. If, however, the slough is extensive or the tissues surrounding it are brittle, any form of suturing is contraindicated, and resection followed by anastomosis should be performed. The principle in the management of these cases is the same as in tears involving loss of tissue, and the danger of a post-operative obstruction must always be borne in mind.

Wounds of the Mesentery.—A tear in the mesentery forms a slit through which a coil of intestine may work its way and subsequently endanger the life of the patient from a mechanic obstruction of the bowel. To guard against this accident the edges of the wound are brought together and permanently united by a continuous overhand silk suture (braided No. 2) (Fig. 842).

Injuries of the Rectum.—The position and anatomic relations of the rectum render it difficult to suture when torn during a pelvic enucleation, especially where the floor of the pelvis is indurated and infiltrated with inflammatory products.

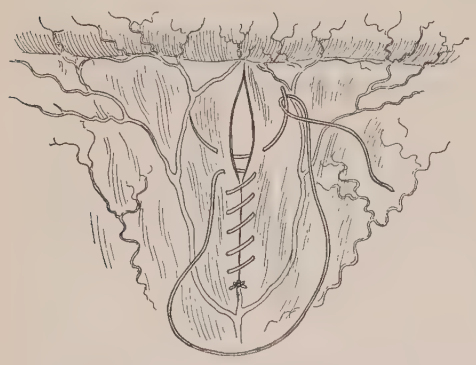


FIG. 842.—THE METHOD OF REPAIRING WOUNDS OF THE MESENTERY.

Before repairing an injury of the rectum the patient should be placed in the Trendelenburg position (45 degrees), the pelvis isolated with large gauze pads, and the field of operation carefully cleansed with gauze sponges. A thorough examination is then made by inspection and the method of repairing the injury decided upon.

Longitudinal, transverse, and irregular tears without loss of tissue are repaired in a similar manner to those occurring in the small intestine, and a double layer of sutures should be used to guard against leakage if there is any doubt as to the efficiency of the sutures.

A braided silk suture (No. 2) should be employed and passed with a small curved intestinal needle; a straight needle cannot be used, as there is not sufficient room in which to manipulate it.

If the bowel is torn completely across, the upper and lower segments should be dissected loose in order to free the ends and approximate them without undue traction upon the sutures. The torn surfaces are then brought together and an end-to-end anastomosis made.

Tears involving great loss of tissue are difficult to repair on account of the danger of constricting the lumen of the bowel and causing a serious stricture. Under these circumstances Kelly has succeeded in closing the opening by suturing the uterus, in retroposition, to the bowel on each side with a continuous suture.

Drainage is always indicated in injuries involving all the rectal coats, except perhaps in very small tears which can be tightly sutured and therefore are not likely to leak. It is always best to drain through the vagina in these cases by

opening the posterior vaginal culdesac, introducing a T-shaped rubber drain, and packing a strip of plain gauze around the seat of injury.

The after-treatment is the same as for an abdominal section, except that the bowels should not be moved for at least four days after operation. Rectal enemata are contraindicated, as they cause distention and strain the line of suturing. The bowels should be moved by a mild laxative pill or half a bottle of citrate of magnesia, and if the rectum contains hardened fecal matter, it should be softened by an injection of half an ounce each of castor oil and glycerin.

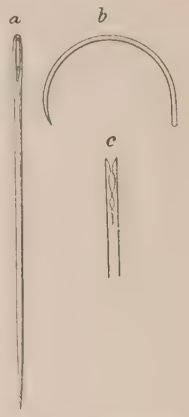


FIG. 843. — INTESTINAL NEEDLES — ACTUAL SIZE.

(*a*) Straight needle; (*b*) small full-curved needle; (*c*) enlarged calyx-eyed end of the curved needle.

General Operative Technic.—Antisepsis.—So soon as an injury is discovered the bowel should be brought outside of the abdominal cavity and laid on a large gauze pad. The wound should then be examined and the necessary measures taken to repair it. In some cases, however, it is impossible to lift the intestine out of the abdomen on account of adhesions or its anatomic relations, and under these circumstances the seat of injury should be isolated from the general peritoneum with gauze pads.

After repairing an injury the intestine should be thoroughly douched with normal salt solution (110° F.) and replaced within the abdomen. If, however, the bowel has not been brought outside of the incision, the site of the repaired injury should be cleansed by local washing (see p. 892) before the gauze pads are removed and the surgeon continues the operation.

In case the abdominal cavity has been soiled by the escape of the contents of the bowel, it should be cleansed by local washing and not by general flushing, which scatters the fecal matter through the abdomen and increases the danger of infection. Sometimes, however, in cases in which an extensive injury has occurred the fecal matter may be so generally distributed among the intestines that local washing will not be sufficient to remove the contamination, and irrigation must therefore be resorted to.

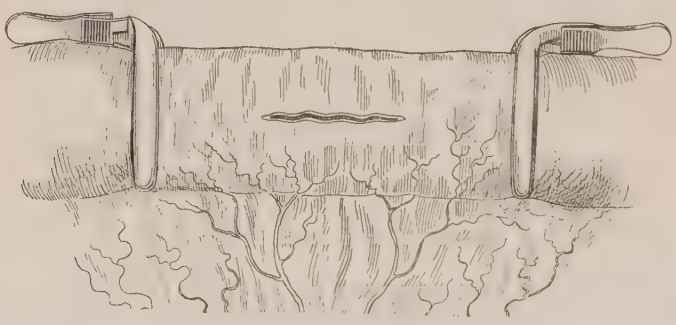


FIG. 844.—THE METHOD OF PREVENTING FECAL MATTER FROM ESCAPING THROUGH A WOUND OF THE INTESTINE WHILE THE SUTURES ARE BEING INTRODUCED (page 920).

Note that the intestine has been stripped of its contents between the clamps.

Needles.—The needles used for intestinal suturing should be slender and have a rounded point in order that they may pass through the walls of the bowel without cutting the tissues (Fig. 843).

I use a long straight needle and a small one with a full curve. The straight

needle is used for domestic purposes and can be purchased in any shop. It is known as a No. 5 darning needle. The curved needle may have an ordinary eye or it may be calyx-eyed and is purchased in shops selling surgical supplies.

Suture Material.—Fine, white, braided silk, No. 2, is the best suture to employ for intestinal operations, as it is very strong and yet sufficiently delicate for all practical purposes. When catgut is indicated, I use No. 1 plain cumol gut.

Special Directions in Suturing.—Before the sutures are introduced the intestine should be stripped between the thumb and the index-finger on each side of the injury and clamps applied to prevent the escape of its contents (Fig. 844).

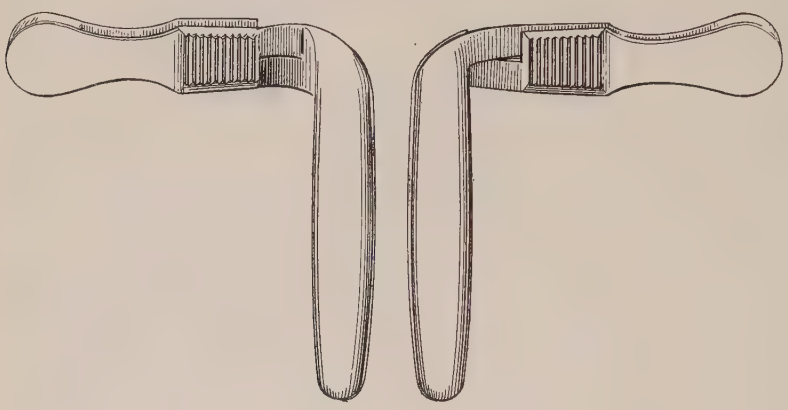


FIG. 845.—MURPHY'S INTESTINAL CLAMPS.

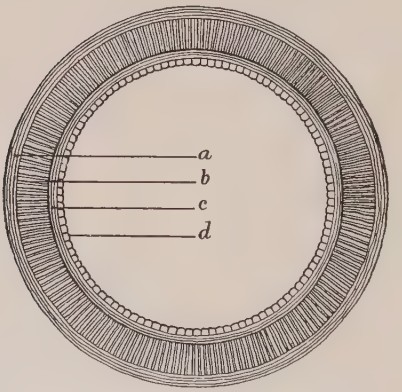


FIG. 846.—DIAGRAM OF THE COATS OF THE INTESTINE.
(*a*) Serous, (*b*) muscular, (*c*) submucous or fibrous, and (*d*) mucous.

Intestinal sutures should penetrate all the coats of the bowel except the mucous, which should never be included unless a reinforcing tier of suturing is employed on account of the danger of leakage occurring from capillary action. The strongest and toughest portion of the intestinal wall is the submucous or fibrous coat (Halsted), and the sutures should therefore always include, if possible, some of its fibers (Fig. 846).

In suturing an intestinal wound the peritoneal coat should be approximated by a comparatively broad surface and the traction upon the sutures should be sufficiently strong to prevent leakage without strangulating the tissues.

Varieties of Intestinal Suture.—The following varieties are employed in repairing tears and making anastomotic communications between different segments of the intestinal canal:

Interrupted Lembert suture.
Continuous Lembert suture.
Cushing's right-angled suture.
Halsted's mattress suture.
Continuous through-and-through suture.

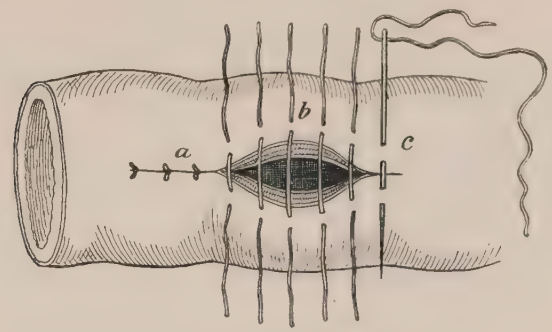


FIG. 847.—INTERRUPTED LEMBERT SUTURES.
The sutures are shown (*a*) tied, (*b*) lying loosely in the tissues, and (*c*) being introduced.

Interrupted Lembert Suture.—The suture is introduced at right angles to the wound and penetrates all the coats of the intestine except the mucous. The needle first picks up a fold of the intestine, about $\frac{1}{10}$ of an inch in width and $\frac{1}{8}$ of an inch from the margin of the tear, and is then passed across the wound to the opposite side, where a similar fold of the intestinal wall is secured in the same manner. When the suture is tied, the two peritoneal surfaces are brought into contact and the margins of the tear are inverted into the lumen of the bowel (Fig. 847).

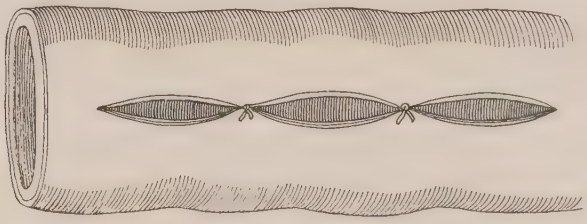


FIG. 848.—INTERRUPTED LEMBERT SUTURE.
Shows a long wound partially closed by two sutures before introducing the Lembert sutures.

The number of sutures depends upon the length of the tear, and, as a rule, they should be placed about $\frac{1}{8}$ of an inch apart. The sutures should not be tied until all of them have been introduced except in the case of a very long wound, which should be partially closed at first by two or more sutures in order to render the approximation more accurate (Fig. 848).

Two temporary traction sutures placed at each end of the wound and clamped with hemostatic forceps, as shown in Fig. 849, are often of service in suturing, as they raise a fold on each side of the wound through which the approximation sutures can be more easily and accurately passed than by picking up the intesti-

nal wall with the needle. Each of these sutures penetrates all the walls of the intestine except the mucous, and the forceps are held by an assistant, who makes traction in the direction of the line of the wound.

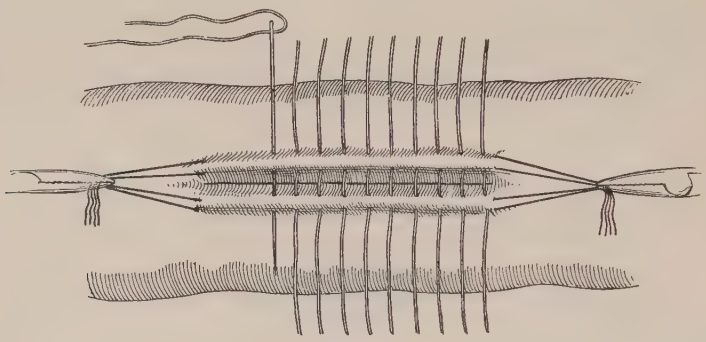


FIG. 849.—TEMPORARY TRACTION SUTURES USED TO FACILITATE THE CLOSURE OF A TEAR IN THE INTESTINE. Note the ridge on each side of the wound and the ease with which the needle is introduced.

Continuous Lembert Suture.—The method of passing the suture and the approximation obtained are the same as in the interrupted Lembert sutures, except that it is continuously applied (Fig. 850).

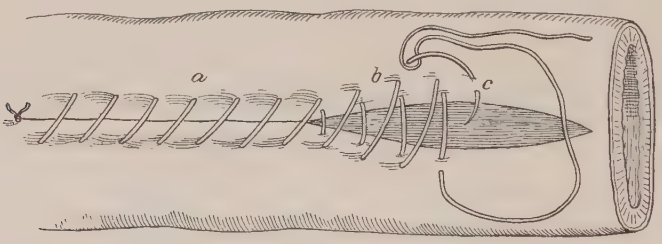


FIG. 850.—CONTINUOUS LEMBERT SUTURE.
The suture is shown (*a*) taut, (*b*) lying loosely in the tissues, and (*c*) being introduced.

Cushing's Right-angled Suture.—The suture is continuous and passes through all the coats of the intestine, except the mucous, on each side of and parallel with the edges of the tear. It approximates the serous surfaces and

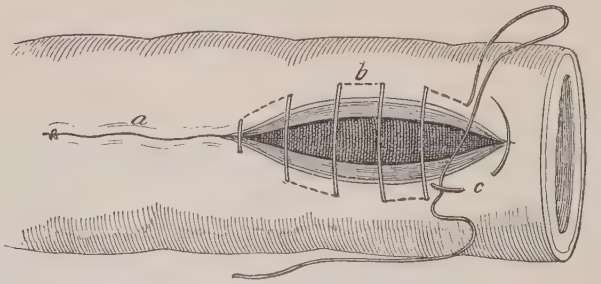


FIG. 851.—CUSHING'S RIGHT-ANGLED SUTURE.
The suture is shown (*a*) taut, (*b*) lying loosely in the tissues and (*c*) being introduced.

inverts the margins of the wound into the lumen of the bowel. The method of introducing this suture is clearly shown in Fig. 851.

Halsted's Mattress Suture.—The suture is interrupted and passes through all the coats of the intestine, except the mucous. It practically consists of two interrupted Lembert sutures joined by a loop on one side of the wound, and apart from this difference its method of introduction is the same. The approximation obtained and the inversion of the edges of the wound into the lumen of the gut are also similar. Temporary traction sutures may often be used with advantage in introducing this suture (Fig. 852).

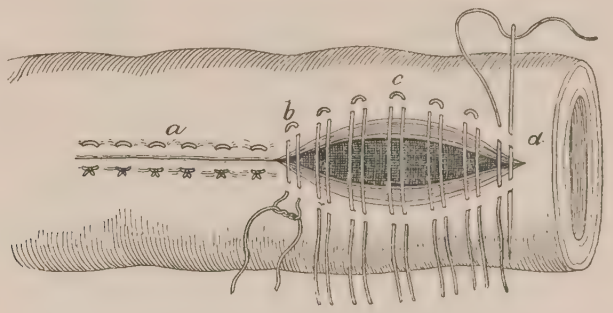


FIG. 852.—HALSTED'S MATTRESS SUTURE.
The suture is shown (*a*) tied, (*b*) being tied, (*c*) lying loosely in the tissues, and (*d*) being introduced.

Continuous Through-and-through Suture.—The suture passes through all the coats of the intestine *including the mucous*, and is employed as a preliminary means of approximating the edges of the wound. The approximation is finally completed by a second tier of either Lembert or mattress sutures, which are introduced and tied in the usual manner (Fig. 853).

Fine catgut (No. 1, plain) is the best material to use for a continuous through-and-through suture, as it is rapidly absorbed and there is no danger of an infected ligature becoming imbedded in the intestinal walls.

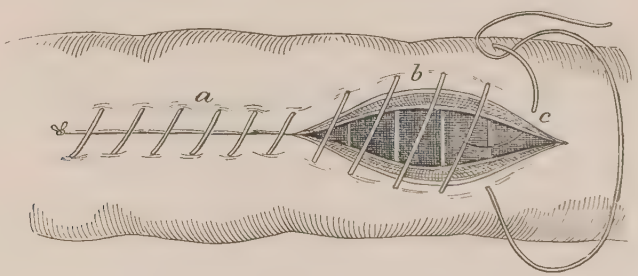


FIG. 853.—CONTINUOUS THROUGH-AND-THROUGH SUTURE.
The suture is shown (*a*) taut, (*b*) lying loosely in the tissues, and (*c*) being introduced. Note that the suture is passed through the mucous membrane.

Intestinal Anastomosis.—Anastomotic communications are made between different segments of the intestinal canal as follows:

1. Simple suturing without the aid of mechanic devices.
   (*a*) End-to-end anastomosis by means of Halsted's mattress sutures.
   (*b*) Lateral anastomosis by means of Halsted's mattress sutures.

2. Suturing with the aid of mechanic devices.
   (*a*) End-to-end anastomosis by means of the Laplace or O'Hara forceps and the Murphy button.
   (*b*) Lateral anastomosis by means of the Laplace or O'Hara forceps and the Murphy button.

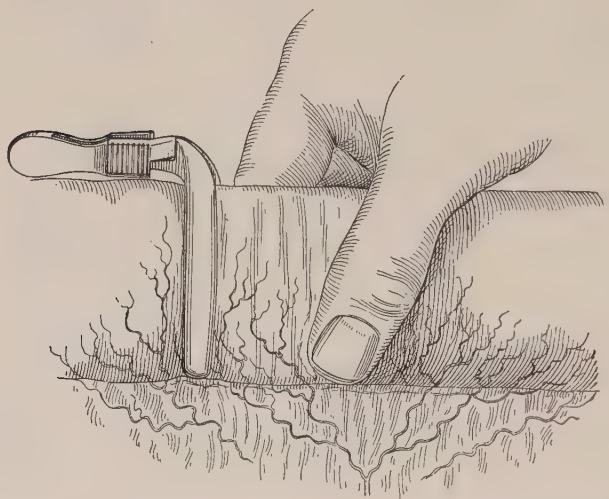


FIG. 854.—END-TO-END ANASTOMOSIS BY MEANS OF HALSTED'S MATTRESS SUTURES—**First Step.**

End-to-end Anastomosis by Means of Halsted's Mattress Sutures.—FIRST STEP.—Strip the segment of intestine to be resected between the thumb and index-finger and apply the clamps (Fig. 854).

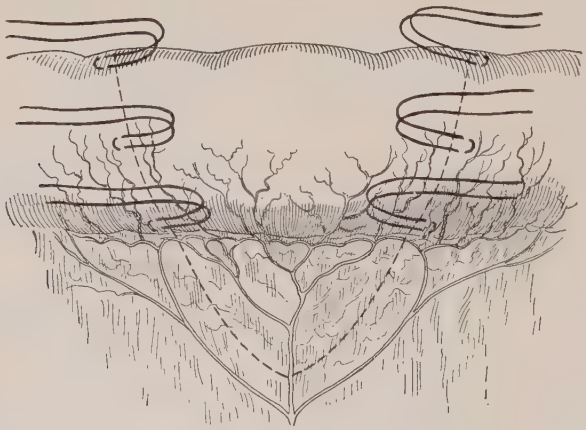


FIG. 855.—END-TO-END ANASTOMOSIS BY MEANS OF HALSTED'S MATTRESS SUTURES—**Second Step.** (MODIFIED FROM HALSTED.)

Note that the two "presection" sutures on the opposite side of the bowel cannot be seen. Also the relation of the sutures with blood-vessels coming from the mesentery.

SECOND STEP.—Place five "presection" mattress sutures around the distal and proximal ends of the bowel about $\frac{1}{8}$ of an inch beyond the lines through which the intestine is to be resected. These sutures are placed as follows: One

on each side of the mesentery, one on each lateral surface, and one on the apex of the bowel. The sutures must be so placed that when the bowel is resected, the blood-vessels of the mesentery will nourish the edges of the divided gut. This is readily accomplished by examining the blood-supply from the mesentery and placing the sutures just beyond the mesenteric vessels (Fig. 855).

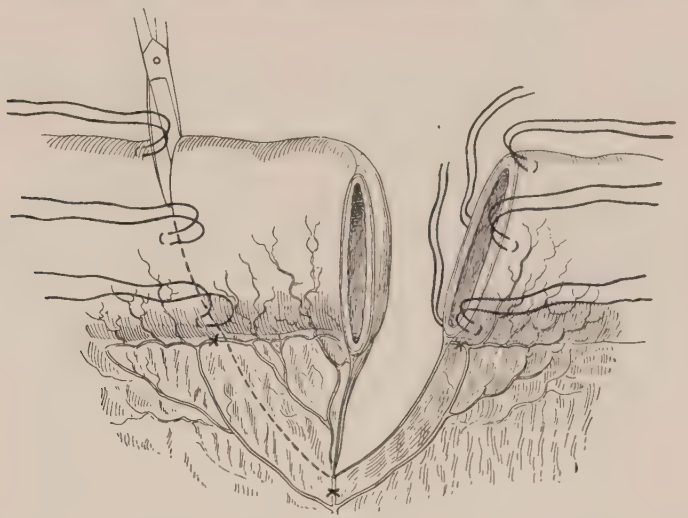


FIG. 856.—END-TO-END ANASTOMOSIS BY MEANS OF HALSTED'S MATTRESS SUTURES—**Third Step.**

THIRD STEP.—The mesenteric vessels within the area of excision are ligated separately with braided silk No. 2, and the intestine resected with straight scissors, carrying the incision into the mesentery and removing a wedge-shaped piece (Fig. 856).

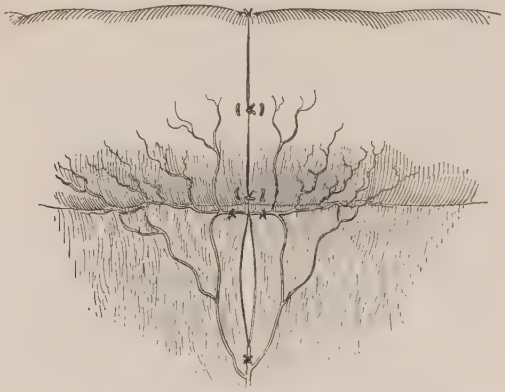


FIG. 857.—END-TO-END ANASTOMOSIS BY MEANS OF HALSTED'S MATTRESS SUTURES—**Fourth Step.**

FOURTH STEP.—The edges of the divided bowel are brought together and the "presection" sutures tied (Fig. 857).

FIFTH STEP.—A series of closely applied mattress sutures are passed completely around the approximated margins of the intestine beyond the "presection

sutures," and after they are all placed each suture is securely tied. In passing these sutures care must be taken not to include any of the blood-vessels near the base of the bowel, otherwise its nutrition will be cut off and gangrene may result (Fig. 858). If there is any doubt as to the efficiency of the approximation, a continuous Lembert suture should be placed completely around the bowel, burying the mattress sutures and guarding against leakage (Fig. 859).

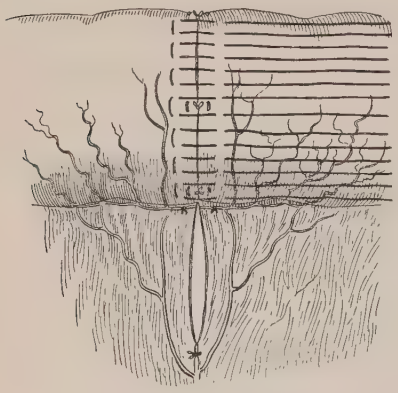


Fig. 858.—Fifth Step.

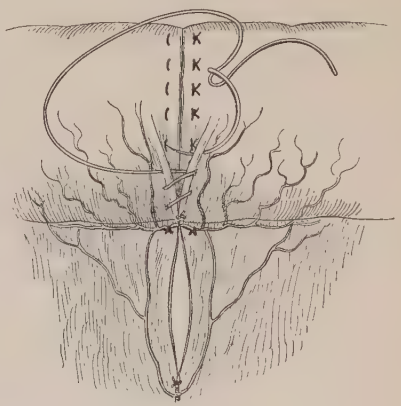


Fig. 859.—Fifth Step.

End-to-end Anastomosis by Means of Halsted's Mattress Sutures.

Sixth Step.—The edges of the mesentery are brought together and united by a continuous silk suture, care being taken not to include any of the blood-vessels going to the intestine (Fig. 860).

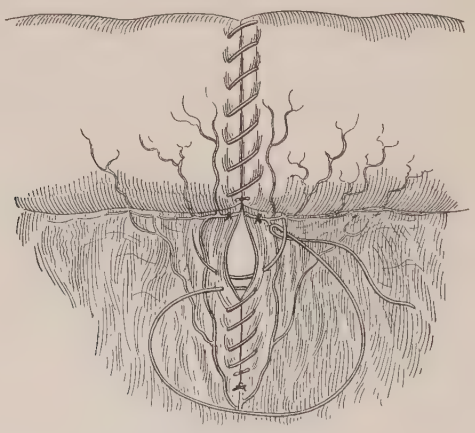


Fig. 860.—End-to-end Anastomosis by Means of Halsted's Mattress Sutures—Sixth Step.

Lateral Anastomosis by Means of Halsted's Mattress Sutures.—First Step.—Strip the segment of intestine to be resected between the thumb and index-finger and apply the clamps (Fig. 854). There should be 5 inches of intestine beyond each clamp after the resected portion is removed, in order to have sufficient length of bowel for the invagination of the free ends and the anastomosis.

Second Step.—The mesenteric vessels within the area of excision are ligated separately with braided silk No. 2, and the intestine resected with straight scissors, carrying the incision into the mesentery and removing a wedge-shaped piece (Fig. 861).

Third Step.—The ends of the intestine are invaginated with forceps and

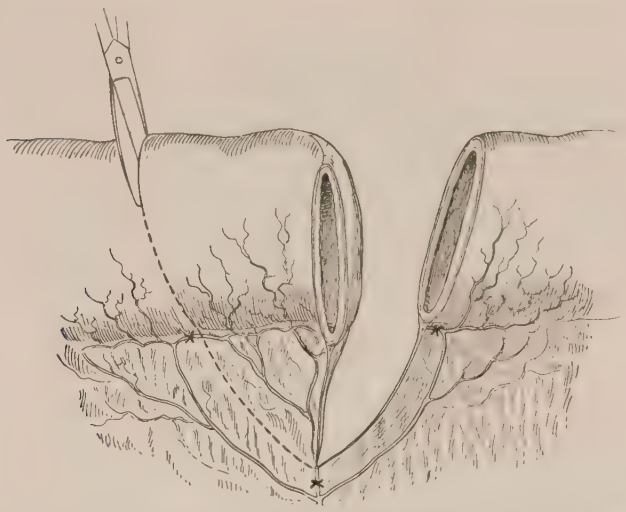


Fig. 861.—Lateral Anastomosis by Means of Halsted's Mattress Sutures—Second Step.

closed with a single row of mattress sutures. At least half an inch of the bowel should be invaginated and its mesentery should be inverted with it (Fig. 862).

Fourth Step.—The upper and lower pieces of bowel are held in contact with each other and united near their mesenteric attachments by a straight

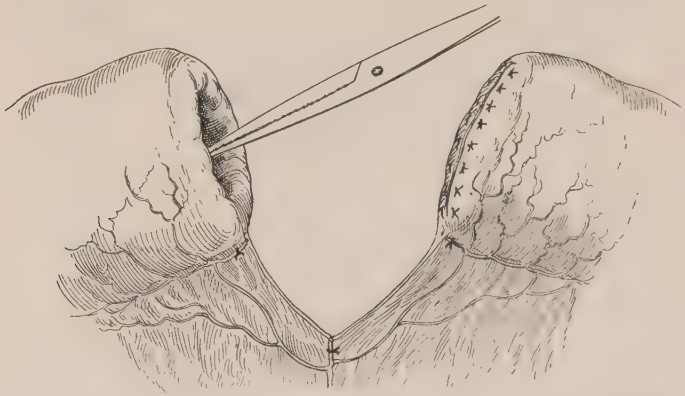


Fig. 862.—Lateral Anastomosis by Means of Halsted's Mattress Sutures—Third Step.

row of eight interrupted mattress sutures. These are then tied and the approximation continued laterally by placing two sutures at each end (Fig. 863).

Fifth Step.—After tying the lateral sutures an anterior row is introduced

on a curved line in order to form an ellipse and broaden the site of the approximation (Fig. 864).

Sixth Step.—The anterior sutures are separated in the center and a longitudinal incision is made in each bowel between the anterior and posterior rows of sutures (Fig. 865).

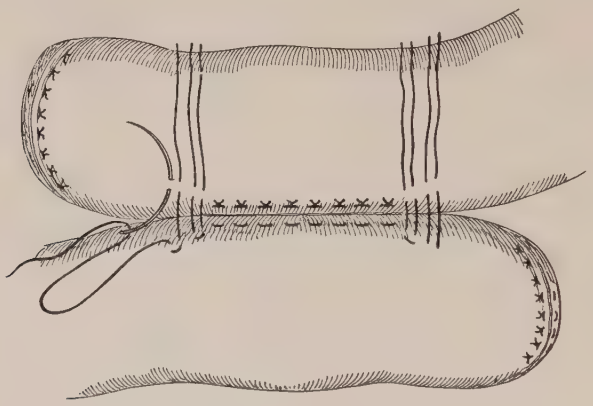


Fig. 863.—Lateral Anastomosis by Means of Halsted's Mattress Sutures. (Modified from Halsted.)—**Fourth Step** (page 927).

Seventh Step.—The anterior sutures are tied and the edges of the mesentery whipped together with a continuous silk suture (Fig. 866).

End-to-end Anastomosis by Means of the Laplace Forceps.—Laplace's forceps is separable into two halves which are firmly held together by a clamp and form two rings at its extremity. These rings are passed into the intestine at

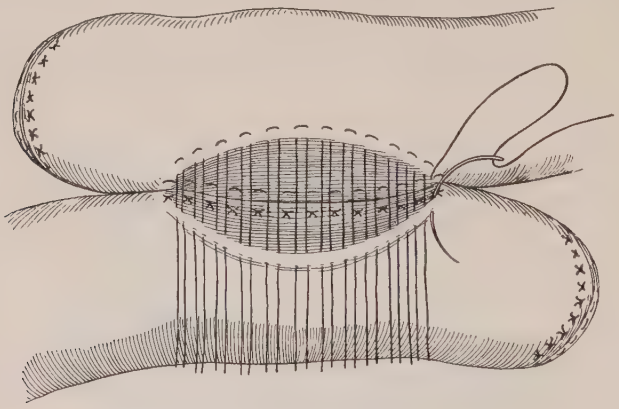


Fig. 864.—Lateral Anastomosis by Means of Halsted's Mattress Sutures. (Modified from Halsted.)—**Fifth Step.**

the seat of anastomosis and hold the parts in close apposition while the sutures are being introduced. After all the anastomotic sutures are tied the clamp is removed and each half of the forceps withdrawn separately from the bowel through the small opening which remains unsutured. This opening is then closed with two sutures, and the operation completed by suturing the mesentery in the usual manner.

The forceps is made in five sizes and can be used with advantage in anastomotic operations on the gall-bladder or the stomach (Figs. 867 and 868).

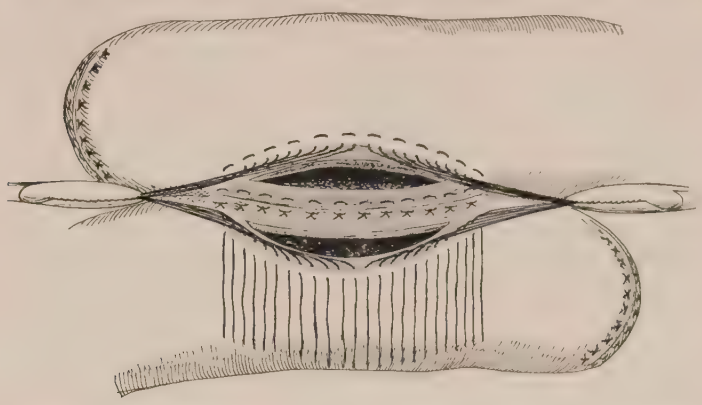


FIG. 865.—LATERAL ANASTOMOSIS BY MEANS OF HALSTED'S MATTRESS SUTURES. (MODIFIED FROM HALSTED.) —Sixth Step.

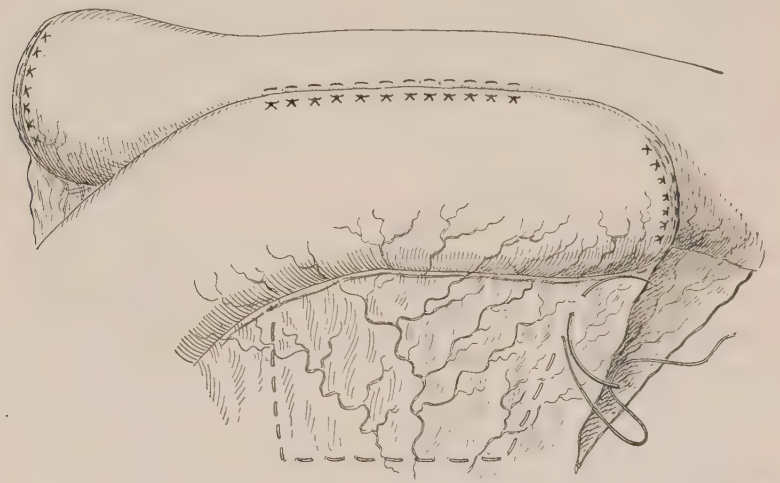


FIG. 866.—LATERAL ANASTOMOSIS BY MEANS OF HALSTED'S MATTRESS SUTURES—Seventh Step.

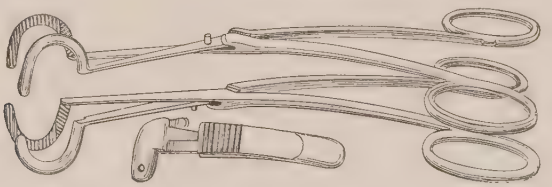


FIG. 867.—END-TO-END ANASTOMOSIS BY MEANS OF THE LAPLACE FORCEPS.
Showing the two halves of the forceps and the clamp.

FIRST STEP.—Strip the segment of bowel to be resected between the thumb and index-finger and apply the clamps (see p. 924, Fig. 854).

Second Step.—Ligate the vessels in the mesentery within the area of excision with silk ligatures and resect the intestine with straight scissors, carrying the incision into the mesentery and removing a wedge-shaped piece (see p. 927, Fig. 861).

Third Step.—The divided edges of the intestine are united by *four preliminary fixation sutures* of plain cumol catgut (No. 2) which hold the parts together

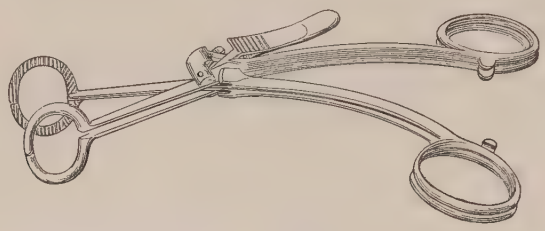


Fig. 868.—End-to-end Anastomosis by Means of the Laplace Forceps (page 928). Showing the forceps clamped and opened as two rings.

and secure an even approximation when the forceps is applied. These sutures pass through all the coats of the intestine and are introduced as follows: The first suture passes through the mesenteric borders and invaginates both laminæ of the mesentery; the second unites the antimesenteric margins; and the third and fourth sutures are placed one on each side so as to approximate the lateral edges of the divided gut (Figs. 869 and 870).

Fourth Step.—The forceps is introduced closed into the lumen of the

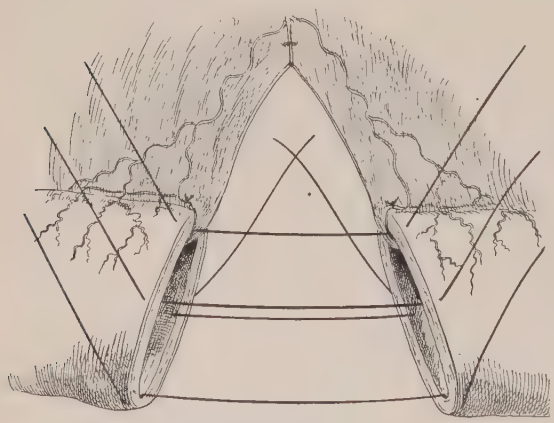


Fig. 869.—Third Step.

Fig. 870.—Third Step.

End-to-end Anastomosis by Means of the Laplace Forceps.

Fig. 869 shows the intestine resected and the fixation sutures in position; Fig. 870 shows the fixation sutures tied.

gut between one of the lateral and the antimesenteric fixation suture (Fig. 871) and then opened slightly so that one ring passes a short distance into the distal and the other into the proximal end of the divided bowel. The free edges of the intestine are now inverted or pushed in between the two rings, which are then closed and the handles of each half of the forceps locked.

Before locking the forceps the seat of approximation must be carefully ex-

amined to make sure that both laminæ of the mesentery are well invaginated and that there is a broad apposition between the serous surfaces. If, therefore, the

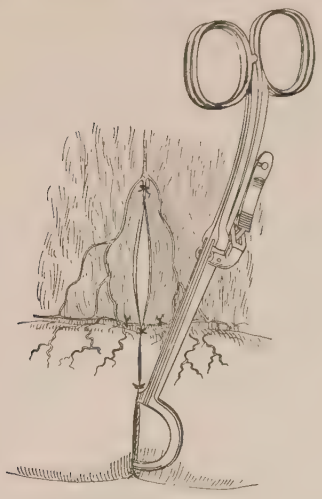


FIG. 871.—Fourth Step.

FIG. 872.—Fourth Step.

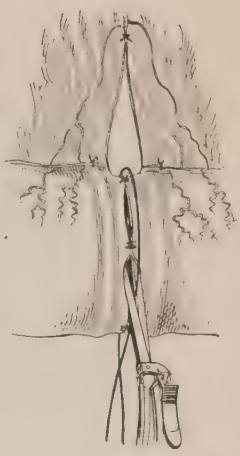


FIG. 873.—Fourth Step.

END-TO-END ANASTOMOSIS BY MEANS OF THE LAPLACE FORCEPS.

Fig. 871 shows the forceps being introduced into the lumen of the intestine between one of the lateral and the antimesenteric suture; Fig. 872 shows each half of the forceps locked; note that the fixation sutures are not inverted; Fig. 873 shows each half of the forceps slightly open and a silk thread passed around the united ends of the intestine to invert the fixation sutures.

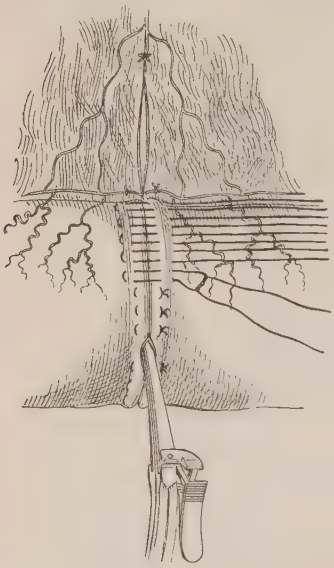


FIG. 874.—Fifth Step.

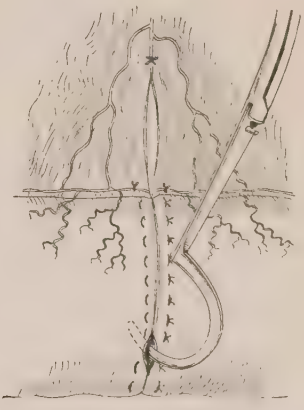


FIG. 875.—Sixth Step.

END-TO-END ANASTOMOSIS BY MEANS OF THE LAPLACE FORCEPS (page 932).

Fig. 874 shows the method of introducing the approximation sutures; Fig. 875 shows the method of withdrawing each half of the forceps from the intestine.

edges of the bowel do not readily become inverted as the forceps is closed, a silk thread is passed around the united ends and drawn taut in order to draw the

preliminary fixation points between the rings and increase the area of approximation (Figs. 872 and 873). The handles of the forceps are then locked and the thread withdrawn.

Fifth Step.—The divided ends of the intestine are united by a series of closely applied mattress sutures which are passed completely around the approximated margins and include the serous, muscular, and part of the submucous coats just beyond the position of the rings of the forceps. The sutures should be introduced close to the handles of the forceps and carried around the bowel, passing between the divided edges of the mesentery up to the point where the forceps emerges from the intestine. The sutures are not tied until they are all introduced (Fig. 874).

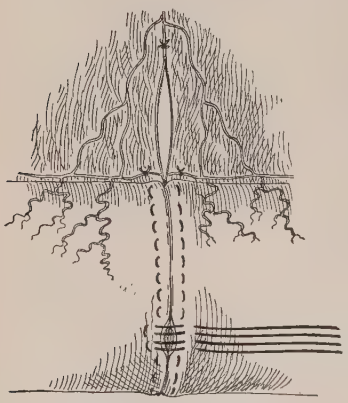


Fig. 876.—End-to-end Anastomosis by Means of the Laplace Forceps—Seventh Step.

Sixth Step.—The forceps is unclamped and the handles unlocked. The two halves of the forceps are then withdrawn separately from the intestine by a semicircular movement (Fig. 875).

Seventh Step.—The small opening which remains between the edges of the intestine after the forceps has been removed is closed by two mattress sutures, and if there is any doubt as to the efficiency of the approximation a continuous Lembert suture is carried around the bowel (Fig. 876).

Eighth Step.—The edges of the mesentery are brought together and united by a continuous silk suture, care being taken not to include any of the blood-vessels which nourish the bowel (see p. 926, Fig. 860).

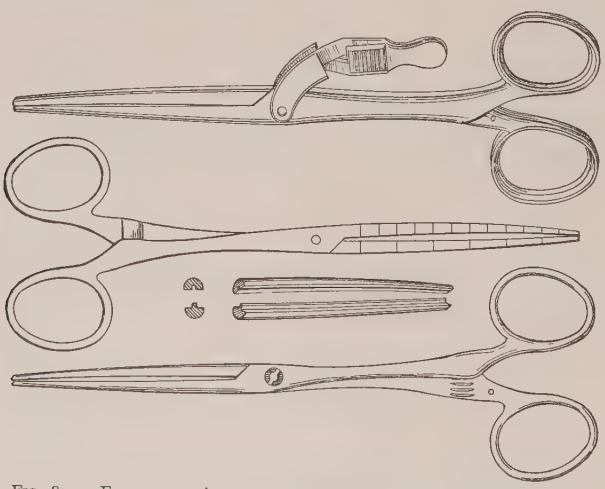


Fig. 877.—End-to-end Anastomosis by Means of the O'Hara Forceps. Showing the O'Hara forceps.

End-to-end Anastomosis by Means of the O'Hara Forceps.—The anastomosis forceps is clearly shown in Fig. 877, and therefore no description is necessary.

First Step.—Strip the segment of intestine to be resected between the thumb and the index-finger and place one forceps transversely across the bowel at the upper border of resection and the other at the lower border (Fig. 878).

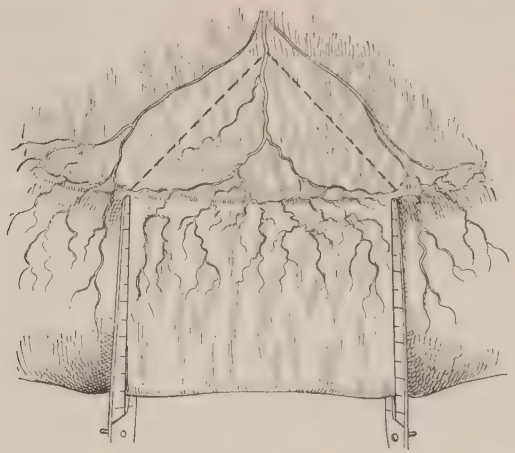


Fig. 878.—End-to-end Anastomosis by Means of the O'Hara Forceps—**First Step.**

The forceps must not encroach upon the mesentery, and their tips are therefore placed on an exact line with the mesenteric attachment. The object of stripping the intestine before applying the forceps is to empty the segment of gut

Fig. 879.—End-to-end Anastomosis by Means of the O'Hara Forceps—**Second Step** (page 934).

to be resected and prevent subsequent contamination of the field of operation by its contents.

The forceps must be so placed that when the bowel is resected the blood-vessels of the mesentery will nourish the edges of the divided gut. This is readily

accomplished by examining the blood-supply from the mesentery and placing the forceps just beyond one of the mesenteric vessels.

Second Step.—The mesenteric vessels within the area of excision are ligated separately with fine silk (No. 2, braided) and the bowel resected with straight scissors as close as possible to both forceps, carrying the incision into the mesentery and removing a wedge-shaped piece (Fig. 879).

Third Step.—The divided ends of the bowel are brought in contact with each other and held in position by applying the serre-fine clamp to the forceps (Fig. 880).

Fourth Step.—The distal and proximal ends of the intestine are united by a series of closely applied mattress sutures which are passed completely around the approximated margins and include the serous, muscular, and part of the submucous coats just beyond the blades of the forceps (Figs. 881 and 882).

The suturing should be started at the antimesenteric aspect of the bowel, close to the blades of the forceps, and carried to the tips of the instruments. The

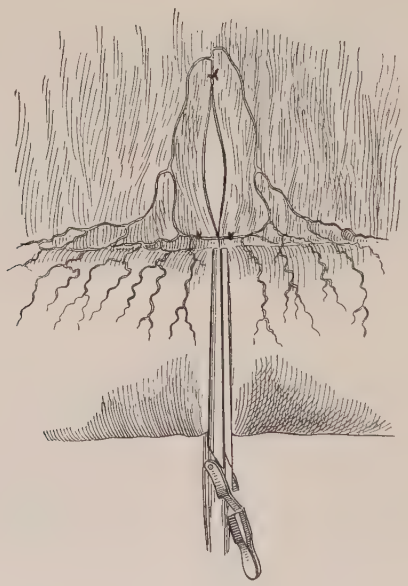


Fig. 880.—End-to-end Anastomosis by Means of the O'Hara Forceps—**Third Step.**

sutures are then tied and the opposite side of the divided bowel exposed to view by reversing the position of the handles of the forceps. The sutures are then passed in the same manner from the mesenteric edge of the bowel and securely tied, when the last suture is introduced close to the blades of the forceps.

Fifth Step.—The serre-fine clamp is removed and one pair of forceps unlocked and withdrawn in a straight line from the bowel. The other forceps is then unlocked and passed above and below the line of anastomosis within the lumen of the gut before it is removed, in order to make sure that the sutures have not penetrated the intestinal mucosa and picked up the opposite wall of the bowel (Fig. 883).

Sixth Step.—The small opening which is left, after the forceps has been removed, in the antimesenteric aspect of the seat of anastomosis is closed by two mattress sutures, and if there is any doubt as to the efficiency of the approximation, a continuous Lembert suture is carried around the bowel (Fig. 884).

SEVENTH STEP.—The edges of the mesentery are brought together and united by a continuous silk suture, care being taken not to include any of the blood-vessels which nourish the intestine (see p. 926, Fig. 860).

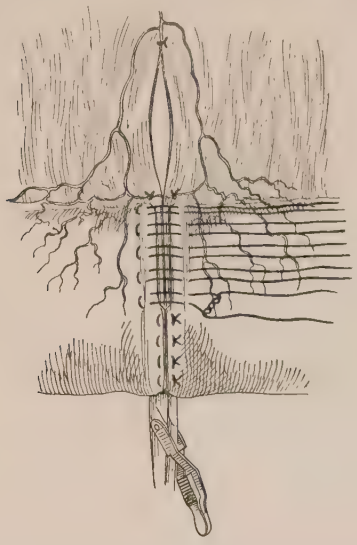


FIG. 881.—Fourth Step.

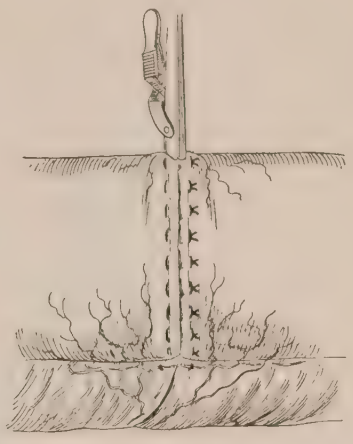


FIG. 882.—Fourth Step.

END-TO-END ANASTOMOSIS BY MEANS OF THE O'HARA FORCEPS.

Fig. 881 shows the method of introducing the approximating sutures from the antimesenteric to the mesenteric portion of the bowel; Fig. 882 shows the sutures passed on the opposite side of the bowel; note the reversed position of the forceps and mesentery.

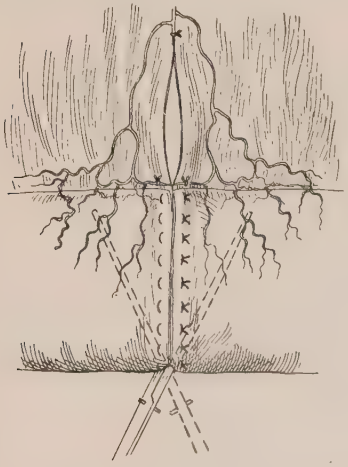


FIG. 883.—Fifth Step.

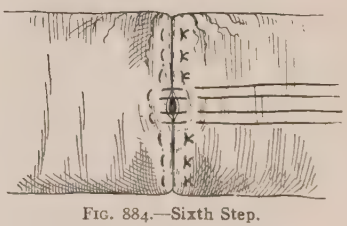


FIG. 884.—Sixth Step.

END-TO-END ANASTOMOSIS BY MEANS OF THE O'HARA FORCEPS.

Fig. 883 shows one portion of the forceps removed and the other testing the lumen of the bowel and the site of anastomosis; Fig. 884 shows the method of suturing the small opening which is left after the forceps has been removed.

End-to-end Anastomosis by Means of the Murphy Button.—FIRST STEP.—Strip the segment of bowel to be resected between the thumb and index-finger and apply the clamps (see p. 924, Fig. 854).

Second Step.—Ligate the mesenteric vessels within the area of excision with silk ligatures and resect the intestine with straight scissors, carrying the incision into the mesentery and removing a wedge-shaped piece (see p. 927, Fig. 861).

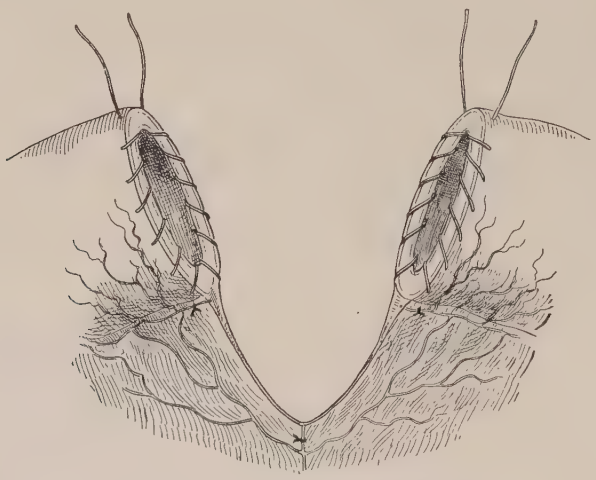


Fig. 885.—End-to-end Anastomosis by Means of the Murphy Button—**Third Step.**

Third Step.—A silk overhand purse-string suture (No. 7, braided silk) is placed around the divided ends of the intestine, before the two halves of the button are inserted into the upper and lower segments of bowel, in order to pucker up their edges and draw in the mesentery within the bite of the button. The

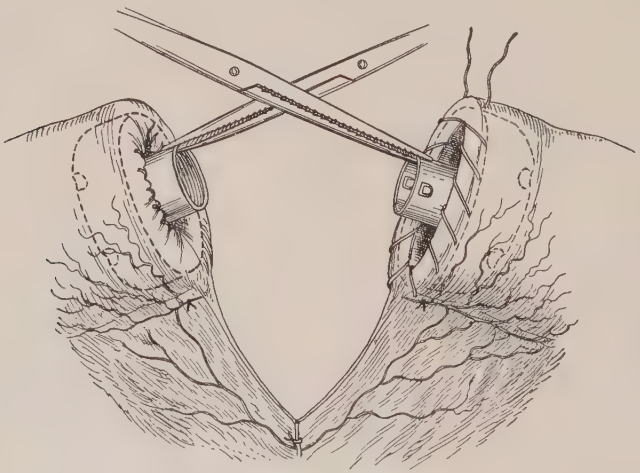


Fig. 886.—End-to-end Anastomosis by Means of the Murphy Button—**Fourth Step.**

suture begins at the antimesenteric surface, passes through all the coats of the intestine, crossing and recrossing at the edge of the mesentery, and finally emerges about ¼ of an inch from its point of entrance (Fig. 885).

Fourth Step.—The female button is held by its stem with a pair of narrow

forceps and inserted into the distal end of the bowel. The purse-string suture is then drawn taut and tied tightly around the stem. The male half of the button is then inserted into the proximal end of the bowel and secured in the same manner (Fig. 886).

FIG. 887.—END-TO-END ANASTOMOSIS BY MEANS OF THE MURPHY BUTTON—**Fifth Step.**

FIFTH STEP.—The operator grasps the ends of the bowel in such a manner as to control the two halves of the button between the thumb and fingers of each hand, and at the same time the assistant removes the forceps from the stems.

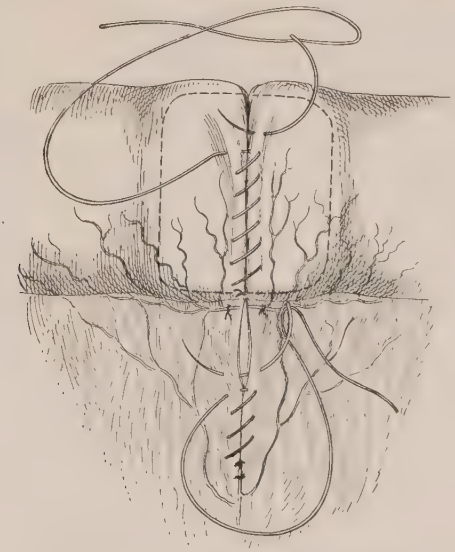


FIG. 888.—END-TO-END ANASTOMOSIS BY MEANS OF THE MURPHY BUTTON—**Sixth Step** (page 938).

The male stem is then slowly inserted into the female until the two halves of the button come together and firmly compress the intervening intestinal walls, thus completing the approximation (Fig. 887).

Sixth Step.—The anastomosis is reinforced by passing a continuous Lembert suture around the margins of the approximation, and the edges of the mesentery are finally whipped together by a continuous silk suture (Fig. 888).

Remarks.—The Murphy button, which is manufactured in several sizes, is an ingenious mechanic device for making an intestinal anastomosis, and is especially valuable when the condition of the patient demands a rapid method of operating.

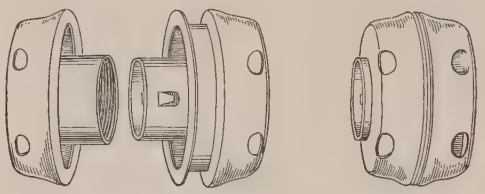


Fig. 889.—The Murphy Button.
The button is shown opened and closed.

The constant pressure exerted upon the intestinal walls with the bite of the two halves of the button results in necrosis, and the instrument is finally dislodged and discharged by the rectum.

Lateral Anastomosis by Means of the Laplace Forceps.—The First, Second, and Third Steps of the operation are the same as in a lateral anastomosis by means of Halsted's mattress sutures (see p. 926).

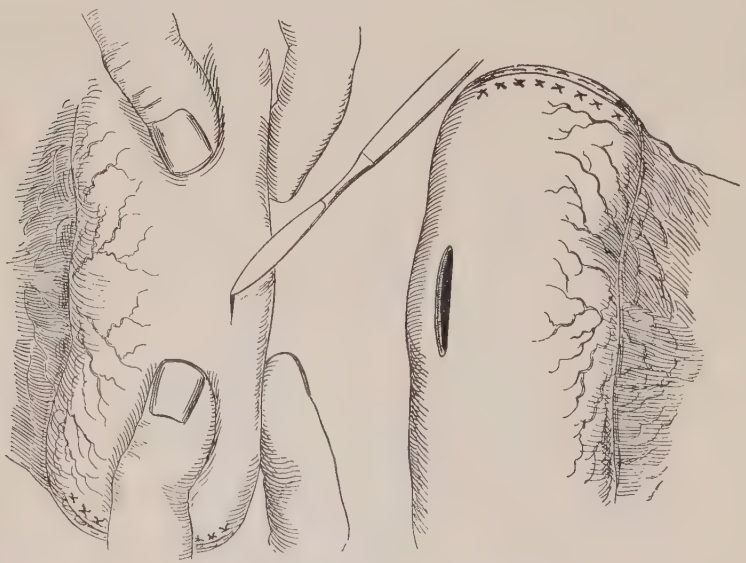


Fig. 890.—Lateral Anastomosis by Means of the Laplace Forceps—**Fourth Step.**

Fourth Step.—Each end of the bowel is held in turn by an assistant in such a manner as to separate its walls while the operator makes a longitudinal opening along the antimesenteric surface about the length of the diameter of the rings of the anastomotic forceps (Fig. 890).

Fifth Step.—The two halves of the forceps are clamped together and then opened so as to form two rings. One ring is now passed through the longitudi-

nal incision into the distal segment of the intestine and the other into the proximal end (Fig. 891). The two rings are finally closed and the serous membranes held in close contact at the seat of anastomosis (Fig. 892).

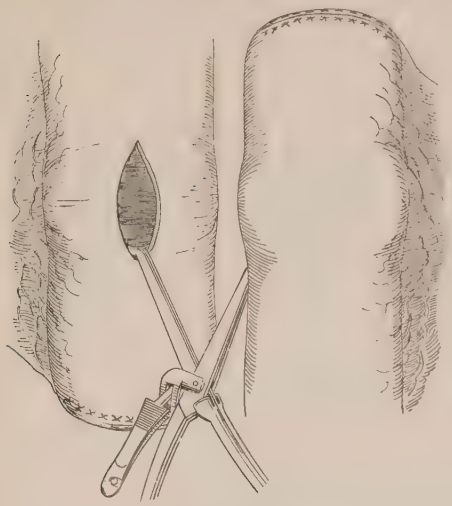


FIG. 891.—Fifth Step.

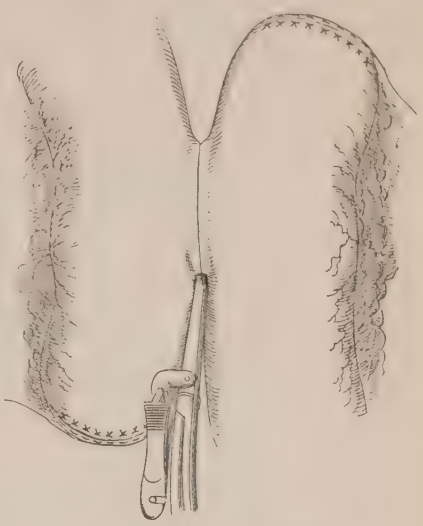


FIG. 892.—Fifth Step.

LATERAL ANASTOMOSIS BY MEANS OF THE LAPLACE FORCEPS.

Fig. 891 shows the forceps being introduced; Fig. 892 shows the two rings of the forceps closed.

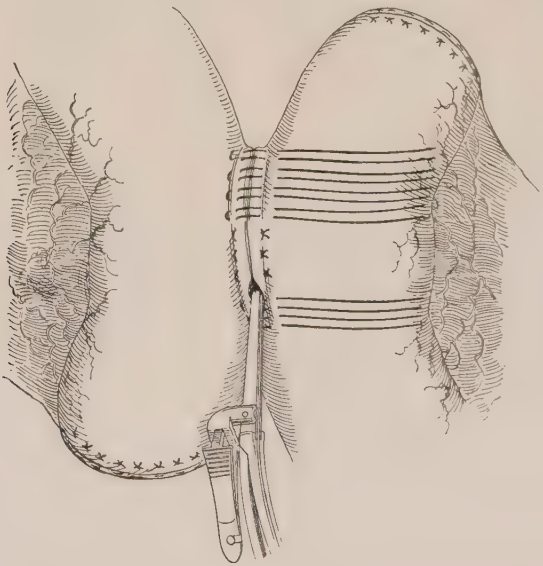


FIG. 893.—LATERAL ANASTOMOSIS BY MEANS OF THE LAPLACE FORCEPS—Sixth Step.

SIXTH STEP.—A series of closely applied mattress sutures are passed around the approximated area and include the serous, muscular, and part of the submucous coats of the intestine just beyond the position of the rings of the forceps.

The sutures should be introduced close to the handles of the forceps and carried around the bowel up to the point where the forceps emerges from the intestine. The sutures are not tied until they are all introduced (Fig. 893).

Seventh Step.—The forceps is unclamped and the handles unlocked. The two halves of the forceps are then withdrawn separately from the intestine by a semicircular movement (see p. 931, Fig. 875).

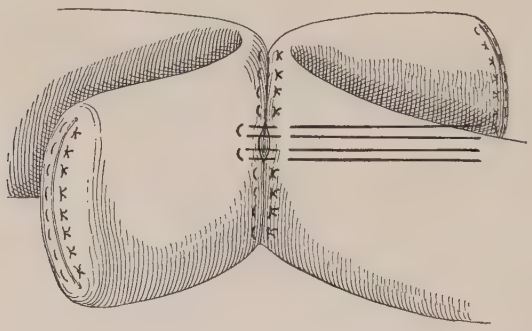


Fig. 894.—Lateral Anastomosis by Means of the Laplace Forceps—**Eighth Step.**

Eighth Step.—The small opening which remains between the edges of the longitudinal incisions after the forceps has been removed is closed by two mattress sutures, and if there is any doubt as to the efficiency of the approximation, a continuous Lembert suture is carried around the bowel (Fig. 894).

Ninth Step.—The mesentery is brought together and united by a continuous silk suture (see p. 928, Fig. 860).

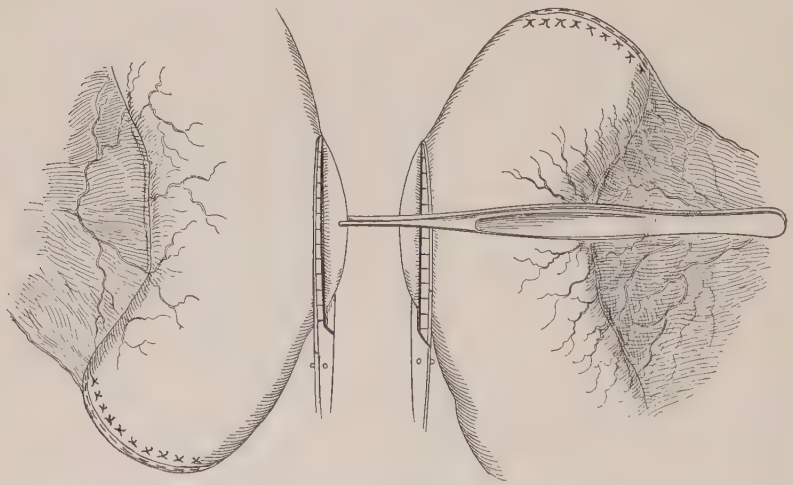


Fig. 895.—Lateral Anastomosis by Means of the O'Hara Forceps—**Fourth Step.**

Lateral Anastomosis by Means of the O'Hara Forceps.—The First, Second, and Third Steps of the operation are the same as in a lateral anastomosis by means of Halsted's mattress sutures (see p. 926).

Fourth Step.—The antimesenteric surface of the upper piece of bowel is picked up with rat-toothed forceps and grasped between the blades of one of

the anastomosis forceps which is placed parallel to the long axis of the gut. The tip of the forceps must be placed on an exact level with the edge of the bowel, and the length of the bite depends upon the size of the desired anastomotic opening. The antimesenteric surface of the lower segment of bowel is then

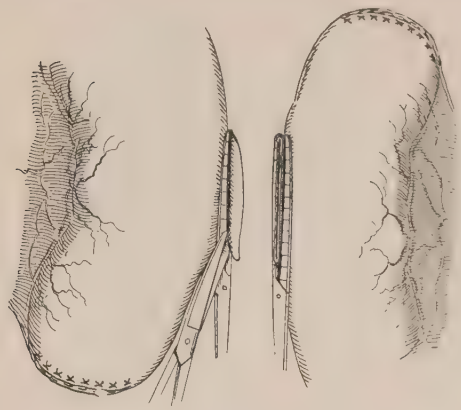


FIG. 896.—**Fifth Step.**

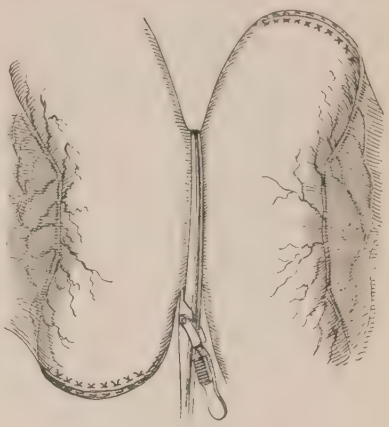


FIG. 897.—**Fifth Step.**

LATERAL ANASTOMOSIS BY MEANS OF THE O'HARA FORCEPS.

Fig. 896 shows the intestine being cut away beyond the bite of the forceps; Fig. 897 shows the anastomotic openings brought together and the forceps locked.

picked up and grasped in a similar manner by the blades of the other forceps, making the bite of the instrument of the same length as that on the upper end of the gut by observing the graduated lines on the blades of the forceps (Fig. 895).

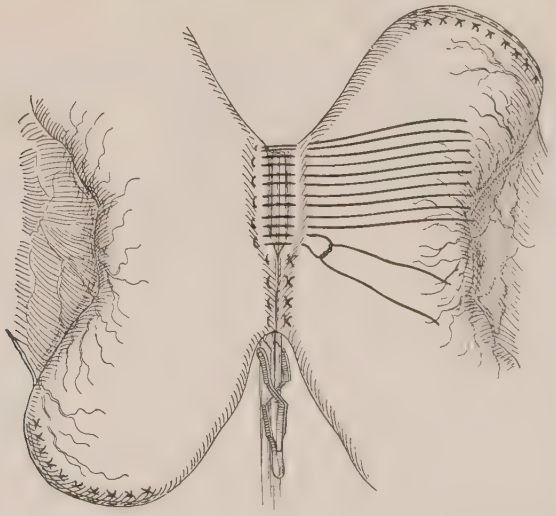


FIG. 898.—LATERAL ANASTOMOSIS BY MEANS OF THE O'HARA FORCEPS—**Sixth Step** (page 942).

FIFTH STEP.—The portion of the intestine that projects beyond the bite of each forceps is cut away as close as possible with straight scissors and the raw edges of the anastomotic openings brought in contact with each other and held in position by applying the serre-fine clamps to the handles of the instrument (Figs. 896 and 897).

Sixth Step.—A series of closely applied mattress sutures are passed completely around the area of approximation just beyond the blades of the forceps. The sutures are first passed from the lock to the tips of the forceps; they are then

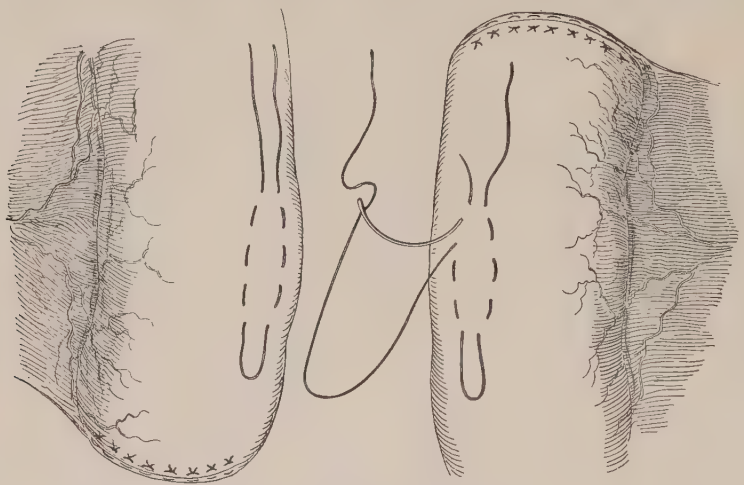


Fig. 899.—Lateral Anastomosis by Means of the Murphy Button—**Fourth Step.**

tied and the opposite side of the bowel exposed to view by reversing the position of the handles of the instrument. Sutures are then placed in the same manner on this aspect of the bowel and securely tied when the last suture is introduced close to the base of the blades of the forceps (Fig. 898).

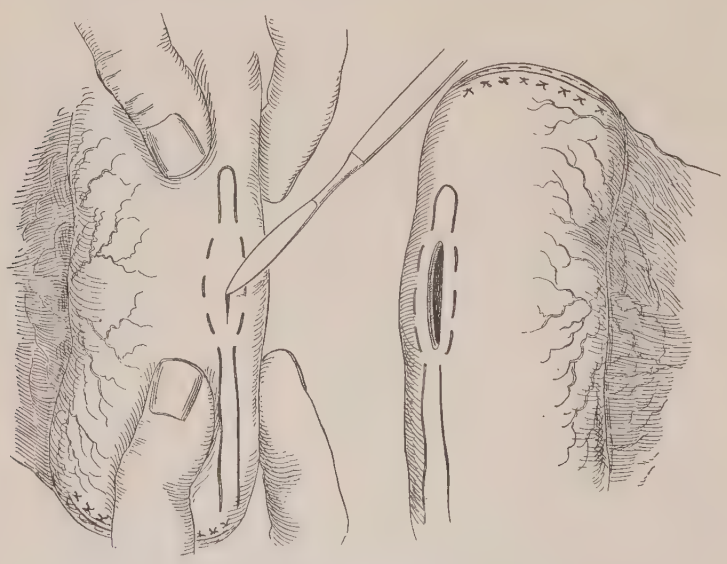


Fig. 900.—Lateral Anastomosis by Means of the Murphy Button—**Fifth Step.**

Seventh Step.—The technic of this step of the operation is similar to the **fifth step** of an end-to-end anastomosis with O'Hara's forceps (see p. 934).

EIGHTH STEP.—The small opening in the intestine remaining after both forceps have been removed is closed by one or two mattress sutures, and if necessary a continuous Lembert suture is carried around the bowel to reinforce the anastomosis (see p. 940, Fig. 894).

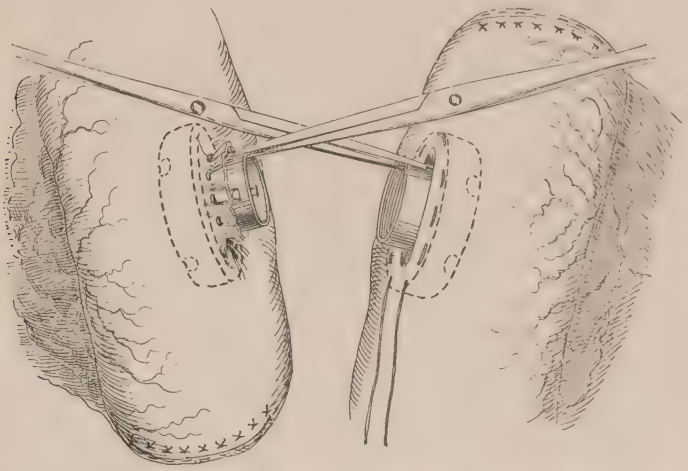


FIG. 901.—LATERAL ANASTOMOSIS BY MEANS OF THE MURPHY BUTTON—**Sixth Step** (page 944).

NINTH STEP.—The two mesenteric folds are whipped together with a continuous silk suture, care being taken not to include any of the blood-vessels which nourish the intestine (see p. 929, Fig. 866).

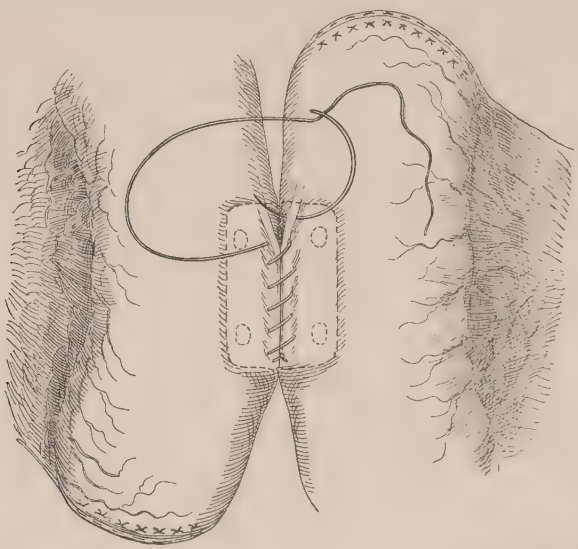


FIG. 902.—LATERAL ANASTOMOSIS BY MEANS OF THE MURPHY BUTTON—**Eighth Step** (page 944).

Lateral Anastomosis by Means of the Murphy Button.—The FIRST, SECOND, and THIRD STEPS of the operation are the same as in a lateral anastomosis by means of Halsted's mattress sutures (see p. 926).

Fourth Step.—Purse-string sutures (No. 7, braided silk) carried by a small full-curved intestinal needle are placed on the antimesenteric surface of the ends of the intestine around the site chosen for the insertion of the two halves of the button. These sutures pass through all the coats of the bowel and are used to draw the edges of the anastomotic openings around the stems of the button (Fig. 899).

Fifth Step.—Each end of the bowel is held in turn by an assistant in such a manner as to separate its walls while the operator makes an opening with a scalpel, slightly shorter than the diameter of the button, into the lumen of the gut, parallel with its long axis and between the lines of the purse-string suture (Fig. 900).

Sixth Step.—The male half of the button is inserted into the proximal end of the gut and the purse-string suture tied. The female half is then passed into the distal end of the bowel and secured in the same manner (Fig. 901). (See End-to-end Anastomosis with Murphy's Button, Fourth Step, p. 936.)

Seventh Step.—The male is slowly pushed into the female stem until the two halves of the button come together and compress the intervening intestinal walls. (See End-to-end Anastomosis with Murphy's Button, Fifth Step, p. 937.)

Eighth Step.—A continuous Lembert suture is passed around the margins of the approximation and the edges of the mesentery are united by a continuous overhand suture (Fig. 902).

CHAPTER XLII.

ANTISEPSIS IN PRIVATE HOUSES.

GENERAL CONSIDERATIONS.

Selection of the Operating Room.—The room should be selected by the surgeon or the attending physician. It should be close to the room to be occupied by the patient after the operation; well lighted, when possible, by a northern exposure; and so constructed as to be readily cleaned.

Arrival of the Nurse.—For *minor operations* the nurse should be sent to the house on the morning preceding the day of operation and given detailed instructions in writing as to the preparation of the patient (see Minor Operations, p. 830) and the necessary arrangements to be made. For *abdominal operations* she should be sent to the patient's house six days before operation, which is the length of time usually devoted to the preparatory treatment (see Abdominal Operations, p. 834).

As in hospital practice the preparatory treatment of the patient may be shortened or lengthened according to circumstances, and in cases of emergency it may be necessary to operate at once.

Preparation of the Operating Room.—On the day before the operation the furniture, curtains, pictures, carpets, and rugs should be removed from the room; the floor scrubbed with soap and water; and the woodwork, the ceiling, and the walls wiped with a wet cloth. The operating and supply table and the washstand and chairs are then scrubbed with soap and water and wiped with a damp cloth.

On the morning of the operation the woodwork and all the articles in the room should be wiped with a wet cloth and everything properly arranged before the surgeon arrives.

ABDOMINAL OPERATIONS.

The nurse must personally attend to the following preparations for the operation:

Articles Required.—1. An ordinary wooden kitchen table to be used for operating upon.

2. Two tables, each about four feet long and twenty inches wide (one to be used for the instruments, etc., and the other for supplies).

3. A washstand or table to hold two basins for sterilization of the hands.

4. A wooden kitchen chair for the anesthetizer.

5. Two china or wooden buckets.

6. Five china or enameled pitchers (for cold, hot, and mixed sterile water and for cold and hot normal salt solution).

7. Four china or enameled basins (two for the sterilization of the hands of the operator and the assistant and two for use during the operation).

8. Three clean sheets (for the operating, instrument, and supply tables).

9. Six clean soft towels.

10. Two woolen blankets (one for the operating table and the other to throw over the patient).

11. Two large tin wash-boilers.

12. A tin pint ladle with a long handle to use for dipping out and measuring the sterile water.

13. Six gallons each of hot and cold sterile water.

14. Three quarts each of hot and cold normal salt solution.

15. Hypodermic syringe.

16. A china dish for formalin solution.

Sterilization of the Water.—The evening preceding the day of operation six gallons of water are boiled for half an hour in one of the wash-boilers (after it has been thoroughly scrubbed and rinsed) and set aside in the operating room to cool overnight. The cover should be kept on the boiler, otherwise the water will be unprotected and may become contaminated. On the morning of the operation six additional gallons of water are boiled for half an hour in the other wash-boiler and placed in the operating room; the tin ladle is sterilized by placing it in the wash-boiler while the water is boiling.

Sterilization of the Pitchers, Basins, Fountain Syringe, and China Dish.—On the day of the operation the pitchers, basins, and china dish are thoroughly scrubbed and rinsed and then boiled for five minutes in the wash-boiler which is used later for sterilizing the hot-water supply. The water is then carefully poured out of the boiler, which is taken to the operating room, and the pitchers and basins removed and placed on the supply table without touching the inside of any of the vessels.

The fountain syringe is wrapped in a towel which is secured with safety-pins and boiled with the pitchers and basins. It is taken out of the wash-boiler and placed on the supply table still wrapped in the towel.

Preparation of the Normal Salt Solution.—Shortly before the operation the normal salt solution should be prepared as follows: Take twelve teaspoonfuls of chemically pure sodium chlorid and place them in a small agate cup holding a pint of water. Boil the solution for ten minutes and pour half into one of the china pitchers and the other half into another pitcher. Then pour with the ladle three quarts of hot sterile water from the wash-boiler into one of the pitchers and three quarts of cold sterile water into the other. The pitchers are then set aside on the supply table and the solutions mixed at the proper temperature when required.

Articles Sent by the Surgeon from the Druggist.—These articles should be delivered at the house of the patient the day before the operation:

1. Four ounces of chemically pure sodium chlorid.
2. A cylinder of oxygen gas and the inhaling apparatus.
3. Twelve hypodermic tablets each of sulphate of strychnin (gr. $\frac{1}{30}$), sulphate of atropin (gr. $\frac{1}{150}$), nitroglycerin (gr. $\frac{1}{100}$), and sulphate of morphin (gr. $\frac{1}{8}$).
4. Eight ounces of tincture of green soap.
5. Fountain syringe (three quarts).
6. Two hot-water bags.
7. One roll of Z.O. adhesive plaster 2 inches wide.
8. Twenty-four corrosive sublimate tablets (1 to a pint = 1 to 1000).
9. One pint of alcohol.
10. Three half-pound cans of ether and four ounces of chloroform.
11. Two hand-brushes made of vegetable fiber.
12. Bed-pan. Small alcohol lamp.
13. One pint of a 5 per cent. aqueous solution of formalin.
14. One yard of rubber sheeting.
15. Two female glass catheters.

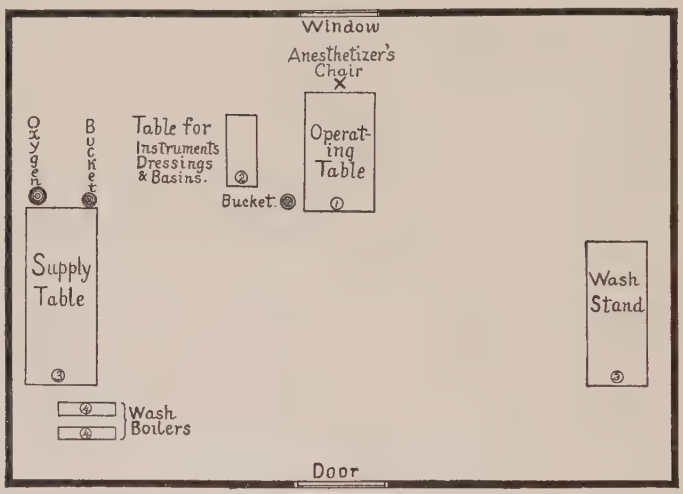


FIG. 003.—DIAGRAM SHOWING THE ARRANGEMENT OF A ROOM PREPARED FOR AN ABDOMINAL OPERATION.

Arrangement of the Operating Room.—Before the arrival of the surgeon the nurse must have everything ready and properly arranged as follows:

1. The operating table is placed in front of a window with a chair for the anesthetizer at its head and a bucket on the floor alongside of the position of the operator. Two blankets and a sheet are folded separately and laid on the table ready to place in position when the adjustable operating frame is attached and the patient is under the anesthetic.

2. The instrument table is covered with a sheet and placed on the right side of the operating table within a convenient distance of where the operator stands. The two basins which contain the sterile water used by the surgeon for his hands during the operation are placed on the end of the table.

3. The supply table is covered with a sheet and placed out of the way on the opposite side of the room. The following articles should be placed on it: (*a*)

Two pitchers containing hot and cold normal salt solution, two filled with hot and cold sterile water, and one empty pitcher for mixing; (*b*) the fountain syringe wrapped in the towel in which it was sterilized; (*c*) a hypodermic syringe and the cardiac and respiratory stimulants: strychnin, atropin, nitroglycerin, and morphin; (*d*) zinc oxid adhesive plaster and the alcohol lamp; (*e*) ether and chloroform; (*f*) a china dish filled with formalin solution.

4. The two wash-boilers containing hot and cold sterile water, the cylinder of oxygen gas, and the second bucket are placed on the floor at the side of the supply table.

5. The washstand or table used for hand sterilization is placed on the opposite side of the room from the supply table, and tincture of soap, two basins, and six soft towels are arranged on it.

Articles Carried by the Surgeon or His Assistants.—The following articles are brought to the patient's house by the surgeon or his assistant at the time of the operation:

Operating paraphernalia.

A portable Trendelenburg frame.

Thermometer, rubber drainage syringe, and catgut.

Operating Paraphernalia.—The method of sterilizing the articles and the manner in which they are conveyed to the house of the patient depend upon whether the surgeon has access to a high-pressure steam sterilizer or not. If he has, the articles are sterilized by high-pressure steam on the day of the operation, otherwise they are packed in a portable sterilizer which is heated on the range or by an alcohol lamp at the patient's house.

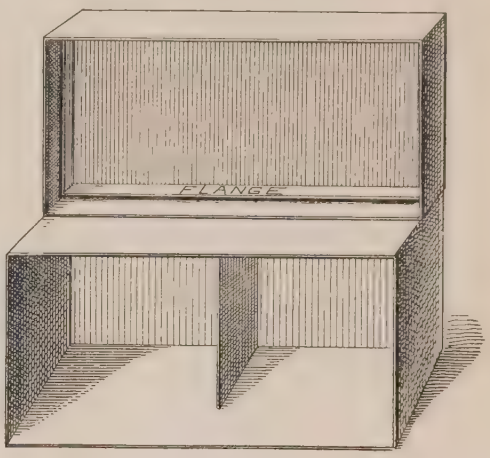


Fig. 904.—Ashton's Large Conveyance Box. Note the flange or inner rim of the lid of the box.

High-pressure Steam Sterilizer.—For operations at private houses I have devised a large conveyance box which is made of heavy copper or tin and divided into two compartments. The box is 20 inches long, 10 inches wide, and 7 inches deep, and the lid is made with an outer and inner rim. The former is 3 inches and the latter $\frac{3}{4}$ of an inch deep, and they are separated from each other by a space of $\frac{1}{4}$ of an inch. This space, which forms a narrow slot into which the upper edges of the box fit, is loosely packed with cotton batting in order to protect the contents of the box after they have been sterilized (Fig. 904). With the upper edges of the box thus imbedded in cotton batting the contents are absolutely protected from contamination and can be kept in an aseptic condition indefinitely. I have a canvas cover for the box which straps tightly over it and keeps the lid firmly pressed down.

I keep two of these boxes at the hospital, each packed for an abdominal section, and when a call comes for an outside operation a list of the necessary instruments, ligatures, sutures, and needles is sent to the clinic nurse, who places them in one of the boxes, which is then sterilized and sent to my office. The box is returned to the hospital after the operation and at once repacked.

The following illustrations show how the box is placed in the sterilizer and

the method of putting on the lid after sterilization without infecting its inner surfaces (Figs. 905 and 906).

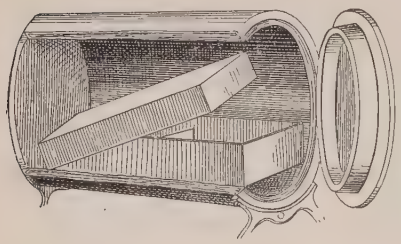
The contents of the box are packed in a special order so that those articles which are used first will be on top and can be taken out without disturbing the rest.

The following articles are placed in the box in the order in which they are given:

1. The abdominal dressings (see p. 827).
2. Two gauze tampons (see p. 827).
3. Glass and rubber drainage-tubes of different sizes; a long metallic nozzle for the fountain syringe; a needle for hypodermoclysis; a cannula for intravenous saline injections; and a rectal tube for enteroclysis.

These articles are wrapped in gauze and care should be taken to prevent the glass drainage-tubes from being broken. The needle, cannula, and irrigating nozzle are wrapped separately in a small towel with a teaspoonful of carbonate of soda (to prevent rusting) and secured with safety-pins.

4. Eight small and four large gauze pads.
5. Four dozen gauze sponges.
6. Eight safety-pins wrapped in gauze.



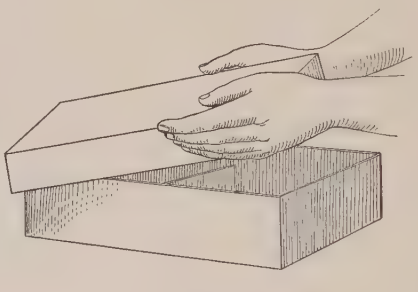


Fig. 905. Fig. 906.

Method of Sterilizing with Ashton's Large Conveyance Box.

Fig. 905 shows the box in the sterilizer and the relative position of its lid; Fig. 906 shows the method of sliding the lid over the box before it is removed from the sterilizer.

7. Eight towels.
8. One sheet.
9. Instruments; needles; silk ligatures and sutures; and silkworm-gut.

The instruments and needles are wrapped in a towel with an ounce of carbonate of soda (to prevent rusting) and secured with safety-pins. During the sterilization the soda is deposited as a fine powder on the instruments and needles and rusting is prevented, which invariably occurs unless this precaution is taken. The cutting instruments are protected by wrapping absorbent cotton around their blades and the needles kept together by passing them through a small gauze pad, which is then folded over upon itself and secured with a safety-pin.

The silk sutures and ligatures are wound on glass slides and wrapped in gauze. The strands of silkworm-gut are wrapped at full length in a towel and secured with safety-pins.

10. Two glass female catheters wrapped in gauze.
11. Four pairs of rubber gloves wrapped in gauze.
12. Three operating gowns—for the surgeon, the assistant, and the nurse.
13. Five hand-brushes. Four of these brushes are wrapped together in gauze and are used for the sterilization of the hands. The fifth brush is wrapped

separately and is used to scrub the abdomen of the patient when the parts are finally sterilized.

Portable Steam Sterilizer.—The Rochester combination sterilizer is one of the best I know of, and can safely be recommended to surgeons who do not have access to a high-pressure steam apparatus. It must be large enough to hold the operating paraphernalia, and I have found from experience that the sterilizer known as No. 108, which is 18 inches long, 7½ inches wide, and 8 inches deep, exclusive of its lower part or base, is sufficiently spacious for all practical purposes. The construction of the sterilizer is very simple, consisting of a double-walled box with a cover which sets on a removable base containing the water for generating steam (Fig. 907). The two wire trays which come with the apparatus are of no practical use and should be discarded. A canvas cover with a leather handle should be made for the sterilizer in order to protect it from gross forms of contamination and facilitate its transportation.

The surgeon should keep the sterilizer at his home with the double-walled box packed and ready to take to an operation.

The following articles are placed in this part of the apparatus in the order in which they are given:

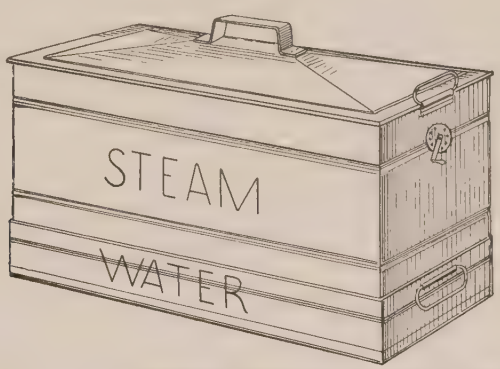


Fig. 907.—The Rochester Combination Sterilizer (No. 108).

1. The abdominal dressings.
2. Two gauze tampons.
3. Glass and rubber drainage-tubes of different sizes, a metallic irrigating nozzle for the fountain syringe, a needle for hypodermoclysis, a cannula for intravenous saline injections, and a rectal tube for enteroclysis.
4. Eight small and four large pads.
5. Four dozen gauze sponges.
6. Eight safety-pins.
7. Eight towels.
8. One sheet.
9. Two glass catheters wrapped in gauze.
10. Four pairs of rubber gloves.
11. Three operating gowns.
12. Five hand-brushes.

The method of packing these articles and protecting them from injury is the same as described under high-pressure steam sterilization.

The instruments, needles, silk ligatures and sutures, and the silkworm gut are placed in the base of the apparatus when a call comes for an operation and

sterilized by the boiling water which generates steam for the double-walled box. The method of packing and protecting the articles from injury is the same as described under high-pressure steam sterilization, with the exception that carbonate of soda is not wrapped up with the instruments and needles.

Portable Trendelenburg Frame.—Dr. G. I. McKelway's portable Trendelenburg frame, which has been modified by Charles Lentz & Sons, Philadelphia, is the best operating table that is made at the present time, as it is very simple in construction and light in weight. The frame is made throughout of tubular steel and the top is covered with thin metal sheeting. It can be readily attached to any kitchen table and made secure by clamps (Fig. 908). I have had a canvas cover made which facilitates the transportation of the table and protects it from gross forms of contamination. The surgeon should keep the table at his home.

Thermometer, Rubber Drainage Syringe, and Catgut.—A combination thermometer for testing solutions, a rubber drainage syringe, and selected sizes of plain and chromicized cumol catgut are carried to the patient's house in a small surgical bag which is packed by the hospital nurse and sent with the

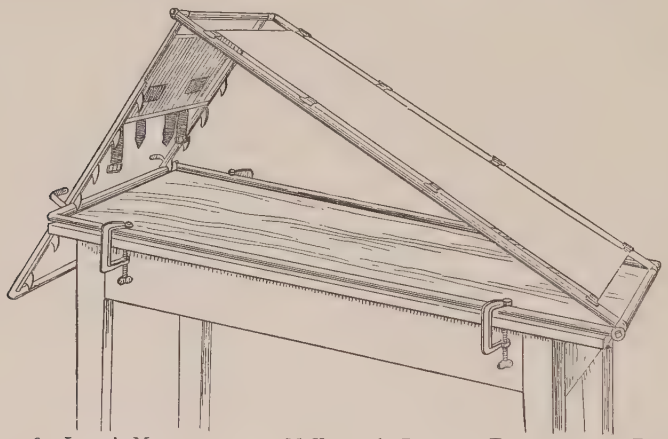


FIG. 908.—LENTZ'S MODIFICATION OF MCKELWAY'S PORTABLE TRENDELENBURG FRAME.

conveyance box to the operator; if the surgeon uses a portable sterilizer, he must keep these articles on hand at his home.

Arrival of the Surgeon.—When the surgeon arrives at the house of the patient, he should proceed as follows:

1. **Inspection of the Operating Room.**—The position of the tables and the arrangement of the various articles in the operating room should be carefully inspected and any mistake or oversight made by the nurse corrected at once. It is a good plan to have a written scheme of the arrangement of the operating room as given on page 946 and check off the preparations made by the nurse in a systematic manner.

2. **Attachment of the Trendelenburg Frame.**—The surgeon directs the nurse how to attach the Trendelenburg frame to the kitchen table and satisfies himself that it is securely clamped and the blanket and sheet properly spread over it.

3. **Thermometer, Rubber Drainage Syringe, and Catgut.**—The thermometer and rubber drainage syringe are put in the solution of formalin and the boxes containing the catgut are placed on the supply table.

4. Sterilization of the Hands.—The nurse takes the conveyance box out of its case and places it on the instrument table. The lid is then removed and placed out of the way.

The surgeon and his assistant remove their coats, vests, collars, and cuffs, and roll up their shirt-sleeves well beyond the elbows. The hand-brushes are then taken out of the conveyance box without touching any other article and the surgeon and his assistant proceed to sterilize their hands by the method described on page 815.

5. Operating Gowns and Rubber Gloves.—The method of putting on the gowns and gloves is described on page 816.

6. Arranging the Instruments, Needles, and Sutures.—The towel containing the instruments and needles is opened and laid on the dressings at one end of the box. The silk ligatures and the silkworm-gut are also unwrapped and placed alongside of the instruments.

7. Final Arrangements.—The patient is carried into the operating room by the anesthetizer and the nurse, and if she is very heavy one of the servants should be ordered to assist. She is then placed on the table and her legs fastened to the Trendelenburg frame. The nurse then secures the patient's hands, unfastens the sheet which is wrapped around her, and removes the abdominal compress (Fig. 767). The operator then scrubs the abdomen with soap and water and douches it with plain sterile water. He then puts on a fresh pair of gloves and protects the field of operation in the manner described on page 837.

Just before proceeding with the operation the nurse puts on a pair of rubber gloves and a sterile gown, which are taken out of the conveyance box and handed to her by the operator.

Sterilization with a Portable Sterilizer.—So soon as the surgeon or his assistant arrives at the house of the patient the sterilization of the operating paraphernalia should be started. The base of the sterilizer is filled with a 1 per cent. solution of carbonate of soda; the apparatus placed on the range or over an alcohol lamp or gas-burner, and the water boiled for one hour. The sterilizer is then placed on the instrument table and the double-walled box lifted from the base. The base of the apparatus is used as a tray for the instruments, needles, and ligatures, and the upper box as a receptacle for the dressings, etc.

While the operating paraphernalia is being sterilized the surgeon should inspect the arrangement in the operating room, attach the Trendelenburg frame, and place the thermometer, drainage syringe, and catgut on the supply table.

MINOR OPERATIONS.

The nurse must personally attend to the following preparations for the operation:

Articles Required.—1. An ordinary kitchen table to be used for operating upon.

2. Two tables each about four feet long and twenty inches wide (one to be used for the instruments, etc., and the other for supplies).

3. A washstand or table to hold two basins for sterilization of the hands.

4. Two wooden kitchen chairs (one for the operator and the other for the anesthetizer).

5. Two china or wooden buckets.

6. Three china or enameled pitchers (for hot, cold, and mixed sterile water) and four china or enameled basins (two for the sterilization of the hands of the operator and his assistant, and two for use during the operation). If two

assistants are required, as, for example, in operations upon the perineum, an extra basin is needed for sterilization of the hands.

7. Three clean sheets (for the operating, instrument, and supply tables).
8. Six clean soft towels.
9. Two woolen blankets (one for the operating table and one to throw over the patient).
10. Two large tin wash-boilers.
11. A tin pint ladle, with a long handle, to use for dipping out the sterile water from the wash-boilers.
12. Six gallons each of hot and cold sterile water.
13. A hypodermic syringe.

Sterilization of the Water.—The same method is employed that is described under Abdominal Operations on page 945.

Sterilization of the Pitchers, Basins, and Fountain Syringe.—The same method is employed that is described under abdominal operations on page 945.

Articles Sent by the Surgeon from the Druggist.—These articles should be delivered at the house of the patient the day before the operation.

1. A cylinder of oxygen gas and the inhaling apparatus.
2. Twelve hypodermic tablets each of sulphate of strychnin (gr. $\frac{1}{30}$), sulphate of atropin (gr. $\frac{1}{150}$), nitroglycerin (gr. $\frac{1}{100}$), and sulphate of morphin (gr. $\frac{1}{8}$).
3. Twenty-four corrosive sublimate tablets (1 to a pint = 1 to 1000).
4. One ounce of tincture of iodin.
5. One ounce of pure carbolic acid.
6. One pint of alcohol.
7. Eight ounces of tincture of green soap.
8. Fountain syringe (3 quarts).
9. Two hot-water bags.
10. Three half-pound cans of ether and four ounces of chloroform.
11. Bed-pan.
12. One yard of rubber sheeting.
13. Two hand-brushes made of vegetable fiber.
14. Two glass female catheters.
15. Four ounces of chemically pure sodium chlorid (to wash specimens).
16. One pint of a 5 per cent. aqueous solution of formalin (to preserve specimens).

Arrangement of the Operating Room.—Before the arrival of the surgeon the nurse must have everything ready and properly arranged as follows:

1. The operating table is placed in front of a window with a chair at its head and foot for the anesthetizer and the operator. A blanket and sheet are smoothly laid over the top of the table and a bucket is placed on the floor for drainage.

2. The instrument table is covered with a sheet and placed on the left at the foot of the table within a convenient distance of where the operator sits. Two basins for sterile water are placed on the end of the table.

3. The supply table is covered with a sheet and placed out of the way on the opposite side of the room. The following articles are placed on it: (*a*) Two pitchers with hot and cold sterile water and one empty pitcher for mixing; (*b*) the fountain syringe wrapped in the towel in which it was sterilized; (*c*) a hypodermic syringe and the cardiac and respiratory stimulants—strychnin, atropin, morphin, and nitroglycerin; (*d*) ether and chloroform; (*e*) corrosive sublimate tablets, tincture of iodin, carbolic acid, and one pint of alcohol.

4. The two wash-boilers containing hot and cold sterile water, the cylinder

of oxygen, and the second bucket are placed on the floor at the side of the supply table.

5. The washstand used for sterilization of the hands is placed on the opposite side of the room from the supply table, and a bottle of tincture of green soap, two basins, and six soft towels are arranged on it.

Articles Carried by the Surgeon or His Assistant.—The following articles are brought to the patient's house by the surgeon or his assistant on the day of the operation:

Operating paraphernalia.
Adjustable leg-holders.
Catgut and Kelly's surgical pads (Fig. 15).

Operating Paraphernalia.—The operating paraphernalia are sterilized by high-pressure steam at the hospital or in a portable sterilizer at the patient's house.

High-pressure Steam Sterilizer.—I use the same kind of conveyance box as described under Abdominal Operations on page 947, and

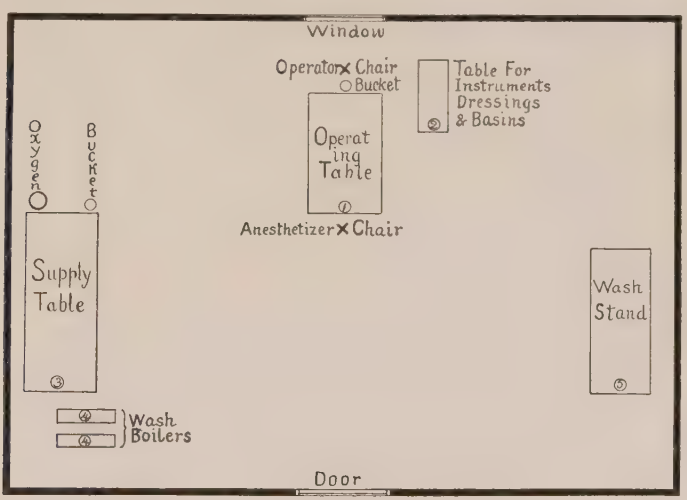


FIG. 909.—DIAGRAM SHOWING THE ARRANGEMENT OF A ROOM PREPARED FOR A MINOR OPERATION.

two of them are always kept packed at the hospital for a minor operation. When a call comes for an outside operation, the necessary instruments, ligatures, sutures, and needles are placed in the box, which is then sterilized and sent to my office.

The following articles are placed in the box in the order in which they are given:

1. A T-bandage.
2. A gauze compress.
3. Two gauze tampons.
4. A loosely rolled layer of absorbent cotton 4 × 12 inches.
5. Three dozen sponges.
6. Eight towels.
7. Two glass female catheters wrapped in gauze.
8. One sheet.
9. Instruments; needles; silkworm-gut; and perforated shot.

The instruments, needles, and silkworm-gut are wrapped in the same manner as described under abdominal operation on page 948, and the perforated shot is placed on a small gauze pad the edges of which are gathered up and tied with a piece of string.

10. Three operating gowns (for the surgeon, the assistant, and the nurse; an extra gown should be provided if two assistants are needed).

11. Four pairs of rubber gloves (an extra pair of gloves should be provided if two assistants are needed).

12. Four hand-brushes (two extra brushes should be provided if two assistants are needed).

Portable Steam Sterilizer.—The Rochester combination sterilizer, which is described under abdominal operations on page 949, is spacious enough for all practical purposes, and should be used by a surgeon who does not have access to a high-pressure steam apparatus.

The sterilizer should be kept at the surgeon's home with the double-walled box neatly packed and ready to take to an operation. The following articles are placed in this part of the apparatus in the order in which they are given:

1. A T-bandage.
2. A gauze compress.
3. Two gauze tampons.
4. A loosely rolled layer of absorbent cotton, 4 × 12 inches.
5. Three dozen sponges.
6. Eight towels.
7. Two glass female catheters wrapped in gauze.
8. One sheet.
9. Perforated shot.
10. Three or four operating gowns.
11. Four or five pairs of gloves.
12. Four or six hand-brushes.

When a call comes for an operation, the instruments, needles, and silkworm-gut are placed in the base of the sterilizer and sterilized at the patient's house by the boiling soda solution which generates the steam for the double-walled box.

Adjustable Leg-holders.—Lentz's modified Edebohls's leg-holders are the best adjustable apparatus I know of (see p. 19, Fig. 3), as they are very light in weight and can be attached to any table (see p. 21, Fig. 7).

I have had a canvas cover made which facilitates the transportation of the leg-holders and protects them from contamination. The apparatus should be kept at the surgeon's home.

Catgut; Surgical Pad.—The clinic nurse places selected sizes of cumol catgut and Kelly's perineal pad in a small bag and sends them to the surgeon with the box containing the operating paraphernalia.

If the surgeon uses a portable sterilizer, he must keep all of these articles on hand at his home.

Arrival of the Surgeon.—When the surgeon arrives at the house of the patient, he should proceed as described under abdominal operations on page 950; the method of using a portable sterilizer is given on page 951.

CHAPTER XLIII.

TECHNIC OF SPECIAL OPERATIONS.

DILATATION AND CURETMENT OF THE UTERUS.

Definition.—This operation consists in the instrumental dilatation of the cervical and uterine cavities and the removal of the endometrium with a sharp curet.

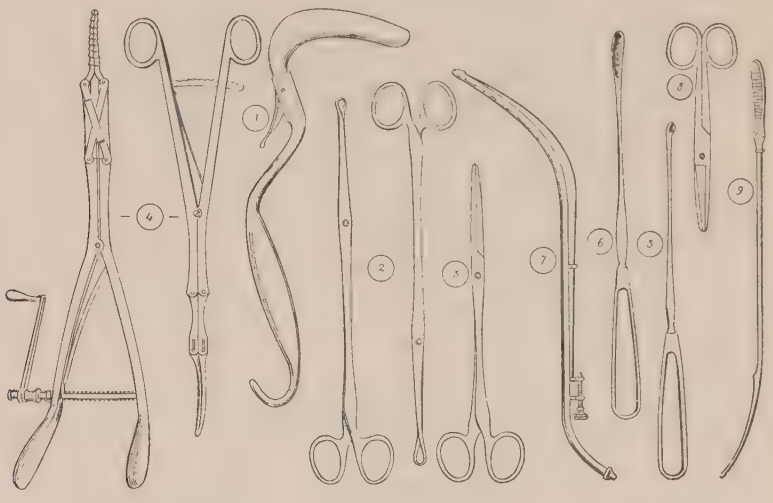


FIG. 910.—INSTRUMENTS USED FOR DILATATION AND CURETMENT OF THE UTERUS.

Position.—The patient is placed in the dorsal position with her feet held by Edebohls's leg-holders and stirrups (see p. 21, Fig. 7).

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

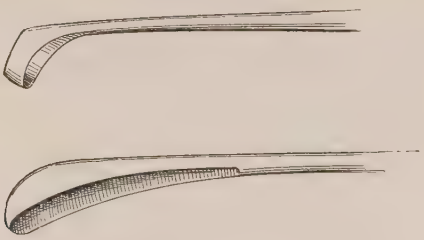


FIG. 911.—DILATATION AND CURETMENT OF THE UTERUS.
The upper figure shows the distal end of Sims's curet; the lower illustration shows the distal end of Martin's curet. Both actual size.

Instruments.—(1) Simon's speculum (curved blade); (2) two bullet forceps; (3) dressing forceps; (4) two Goodell's uterine dilators (heavy and light); (5) Sims's sharp curet; (6) Martin's curet; (7) dilating uterine douche; (8) straight scissors; (9) uterine sound (Fig. 910).

Operation.—First Step.—Ascertain the position of the uterus and the direction of its canal by the use of a uterine sound and vagino-abdominal palpation.

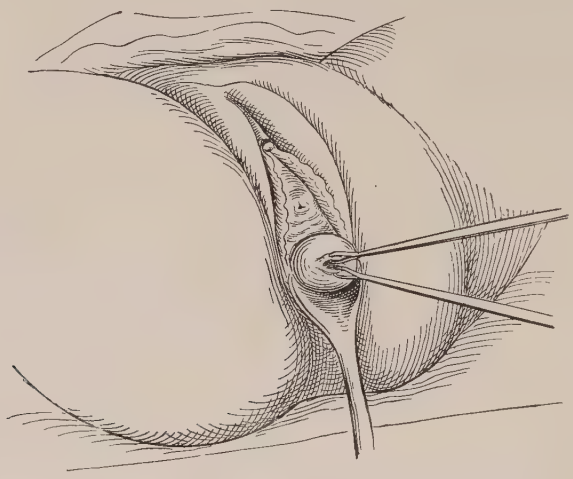


FIG. 912.—DILATATION AND CURETMENT OF THE UTERUS—**Second Step.**

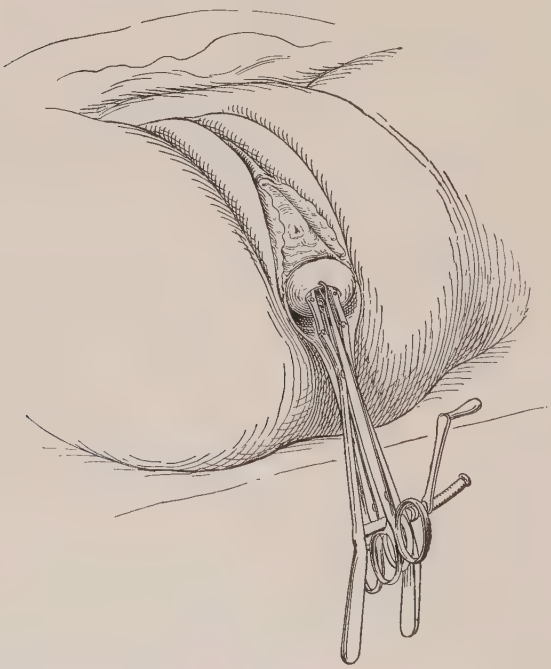


FIG. 913.—DILATATION AND CURETMENT OF THE UTERUS—**Third Step.**
Shows the handles of both bullet forceps hooked over the graduated bar of the dilator.

Second Step.—Simon's speculum is introduced into the vagina and the anterior and posterior lips of the cervix seized with bullet forceps and drawn down toward the vulva (Fig. 912).

Third Step.—The upper pair of forceps is handed to the assistant, and while the operator steadies the cervix with the lower pair, he introduces the light dilator into the cervical canal and expands the blades. The heavy dilator is

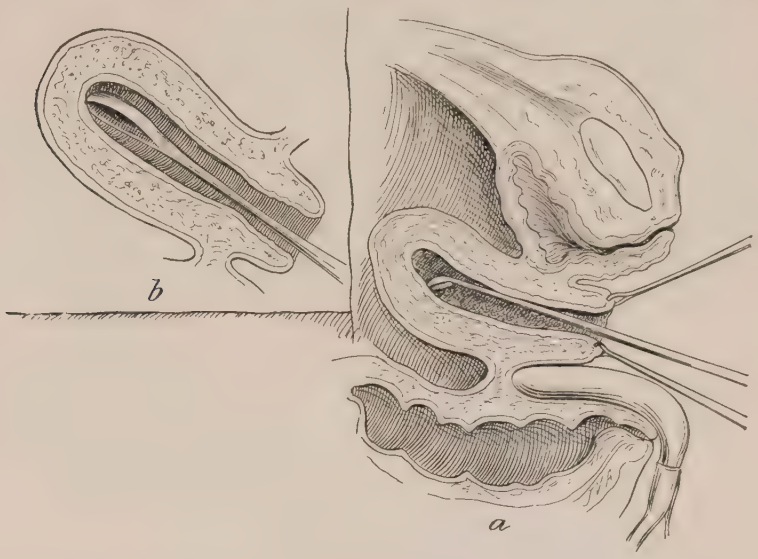


FIG. 914.—DILATATION AND CURETMENT OF THE UTERUS—**Fourth Step** (page 958).
Illustration *a* shows the endometrium being removed with Sims's curet; illustration *b* shows the mucous membrane on the fundus being removed with Martin's curet.

FIG. 915.—DILATATION AND CURETMENT OF THE UTERUS—**Fifth Step** (page 958).
Illustration *a* shows the uterine cavity being irrigated; illustration *b* shows a temporary packing being placed in the uterus.

then gradually passed into the uterine canal and the handles of both bullet forceps hooked over the graduated bar (Fig. 913).

The handle of the set screw is now slowly turned and the blades of the dilator expanded until the degree of dilatation registers an inch or more on the graduated bar. The instrument is then kept in this position for two or three minutes in order to paralyze the muscular fibers of the cervix and insure full dilatation.

Fourth Step.—The dilator is withdrawn and the upper pair of bullet forceps handed to the assistant. The operator then steadies the cervix with the lower pair of forceps and thoroughly scrapes the entire uterine surface with Sims's sharp curet. Martin's curet is finally passed into the uterine cavity and the narrow strips of endometrium remaining across the fundus are carefully scraped away (Fig. 914).

Fifth Step.—The uterine cavity is irrigated with a hot solution of corrosive sublimate (1 to 2000) and temporarily packed with a narrow strip of gauze, which is pushed into the uterus with the dressing forceps (Fig. 915).

Sixth Step.—A small gathered-up piece of gauze is held in the grasp of the dressing forceps and dipped into pure carbolic acid. The temporary pack-

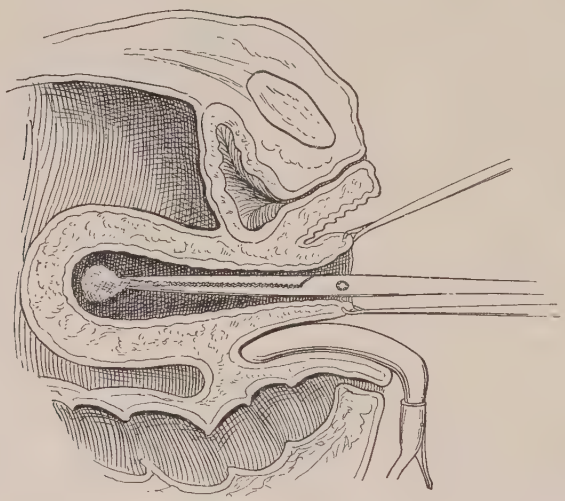


FIG. 916.—DILATATION AND CURETMENT OF THE UTERUS—**Sixth Step.**
Shows the uterine cavity being swabbed out with pure carbolic acid.

ing is then quickly removed and the uterine cavity swabbed out with the acid, care being taken not to burn the vagina (Fig. 916).

Seventh Step.—The vagina is thoroughly cleansed with a sponge, the bullet forceps removed, and a gauze tampon loosely packed against the cervix. A gauze compress is then placed over the vulva and secured by a T-bandage.

Variation in the Technic.—When dilatation and curetment of the uterus are employed in the treatment of obstructive dysmenorrhea due to a sharp flexion, the uterine cavity should be tightly packed with a narrow strip of plain gauze after it has been swabbed out with carbolic acid (Fig. 917). The object of this procedure is to keep the uterine canal perfectly straight and prevent contraction of the muscular fibers of the uterus for a few hours after the operation. The packing is removed at the end of twenty-four hours and the same treatment subsequently carried out as recommended in cases in which no uterine tampon is employed.

Special Directions.—Force should never be exerted in introducing the uterine dilators, as there is danger of making a false passage and seriously injuring the uterus. There is no difficulty, as a rule, in passing the heavy dilators into the uterus if the light instrument is used first and the canal partially dilated. Usually the heavy instrument can be readily introduced by inserting it as far as possible in the canal and then expanding the blades by squeezing the handles together. This maneuver, repeated several times, gradually straightens out the canal and dilates it sufficiently to allow the blades of the dilator to finally slip into the uterine cavity.

Dilatation of the uterus must be accomplished very gradually, otherwise the muscular fibers of the cervix will not have time to stretch and a serious tear may occur. The amount of resistance offered to the expansion of the blades is a valuable guide as to the rapidity with which dilatation can be effected without traumatism, and when it becomes marked the operator should stop for one or two minutes in order to guard against an accident.

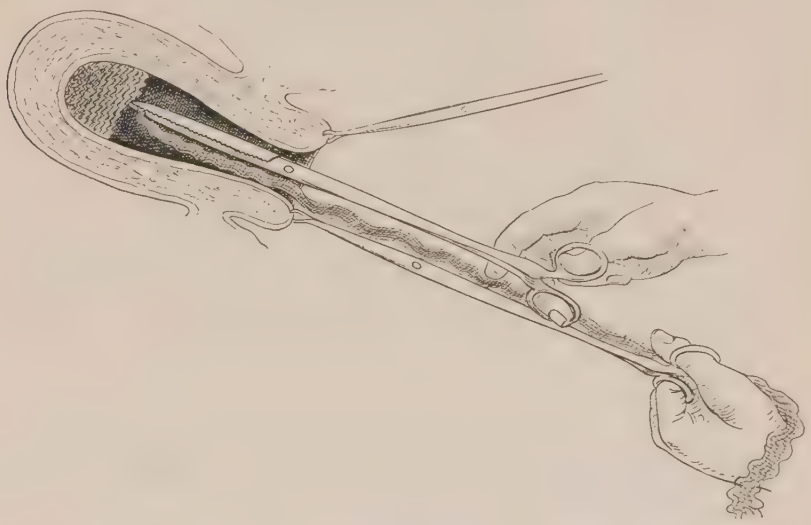


FIG. 917.—DILATATION AND CURETMENT OF THE UTERUS. **Variation in the Technic.**
Shows a permanent packing of gauze being introduced into the uterine cavity.

The crank which I have devised as a substitute for the small button or set screw on the graduated bar of the heavy dilators is a distinct advantage, as the leverage is entirely under the control of the operator, and the rapidity of the dilatation can therefore be accurately regulated. A small button, on the other hand, is difficult to manipulate, and the pressure required to turn it so great that the tips of the fingers and thumb of the operator are apt to be bruised (Fig. 918).

The use of bullet forceps to grasp the cervix and hold it in a fixed position during dilatation and curetment is better than employing tenaculums, as the latter instruments have an insecure hold and are very likely to tear the tissues. Again, when the handles of the forceps are hooked over the graduated bar of the dilators, the traction upon the cervix is steady and firm and there is no chance of the blades slipping out of the uterine cavity.

A curetment should always be done with a sharp instrument, as a dull curet only scrapes off the superficial layer of the mucous membrane and does more

harm than good, as it leaves the diseased endometrium in a bruised and torn condition.

Excessive bleeding rarely occurs during curetment of the uterus, and, as a rule, the subsequent discharges soon become serosanguineous in character.

If the uterus is perforated during curetment, the accident need not cause any special worry unless the uterine cavity is the seat of a virulent infection, in which case septic peritonitis is likely to develop and destroy the patient. When the uterus is punctured, the curetment must be stopped and no applications made to the uterine cavity. The local use of carbolic acid or flushing out the uterine cavity under these circumstances is especially dangerous, as the fluids may escape into the general peritoneum and set up an inflammation.

The uterine cavity should never be packed with gauze after curetment unless a special indication is present, such as a hemorrhage in cases of abortion or where it is necessary to keep the canal straightened out for several hours in cases of obstructive dysmenorrhea due to flexion. A dilated uterine canal and a patulous internal and external os are conditions which favor free drainage,

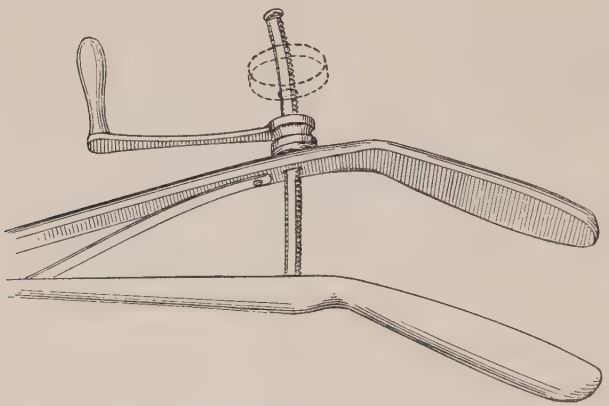


FIG. 918.—THE HANDLE OF GOODELL'S HEAVY UTERINE DILATOR (page 959).
Showing Ashton's crank as a substitute for the button on the graduated bar. The button is shown by dotted lines.

and the use of packing therefore is a delusion, as it obstructs the escape of discharges.

After-treatment.—The vaginal tampon is removed in twenty-four hours and the vagina subsequently irrigated once a day with a quart of hot corrosive sublimate solution (1 to 2000), followed by a gallon of hot sterile water. At the end of the first week the corrosive sublimate irrigations are stopped and the douches of plain sterile water continued for two months.

The patient, as a rule, voids her urine spontaneously, although in some cases she may be unable to empty the bladder and a catheter must be employed for a day or two.

The bowels should be moved on the second day by a purgative dose of citrate of magnesia or half an ounce of Rochelle salt in a tumblerful of water, and then kept open daily with a mild laxative pill followed by a simple rectal enema. The occasional use of a saline purgative during convalescence is of decided advantage, as it depletes the pelvic blood-vessels and lessens the congestion which is usually present.

During the first two days a liquid diet (see p. 106) should be given, and then

the patient should be placed upon a mixed soft and convalescent diets (see pp. 111 and 114).

The patient should remain in bed, as a rule, for one week after curetment, although it may be advisable in some cases, on account of the presence of an enlarged or subinvoluted uterus, to extend the time and keep her at rest in the recumbent position for two or three weeks.

CLITORIDECTOMY.

Definition.—This operation consists in the excision or removal of the clitoris.

Position.—The patient is placed in the dorsal position with her feet held by Edebohls's leg-holders and stirrups.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

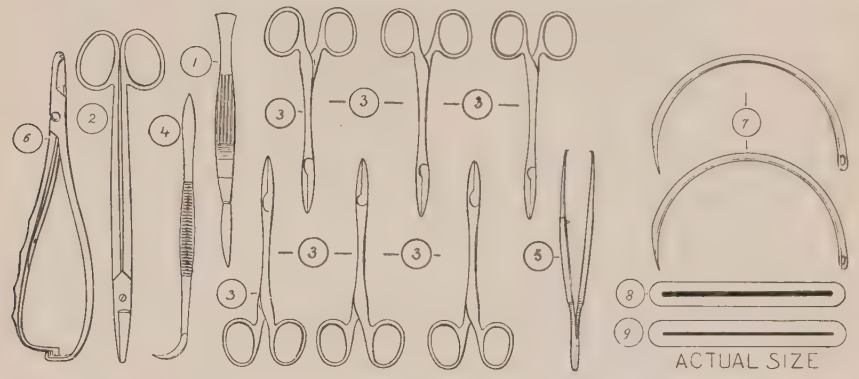


FIG. 919.—INSTRUMENTS, NEEDLES, AND SUTURE MATERIALS USED IN THE OPERATION OF CLITORIDECTOMY.

Instruments.—(1) Scalpel; (2) sharp-pointed scissors curved on the flat; (3) six short hemostatic forceps; (4) dry dissector; (5) rat-tooth tissue

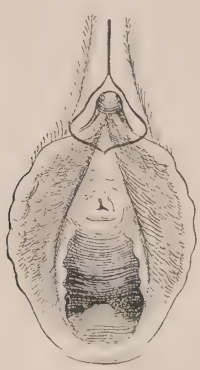


FIG. 920.—First Step.

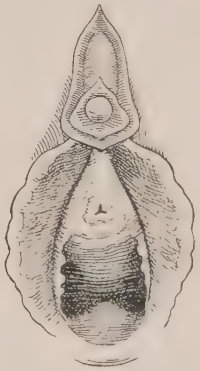


FIG. 921.—Second Step.

CLITORIDECTOMY (page 962).

forceps; (6) needle-holder; (7) two small full-curved Hagedorn needles; (8) plain cumol catgut (No. 2, six envelopes); (9) silkworm-gut (20 strands).

Operation.—First Step.—An incision is made completely around the glans and carried upward along the dorsum of the clitoris close to the symphysis.

Second Step.—The tissues surrounding the clitoris are dissected away and the organ exposed (Fig. 921).

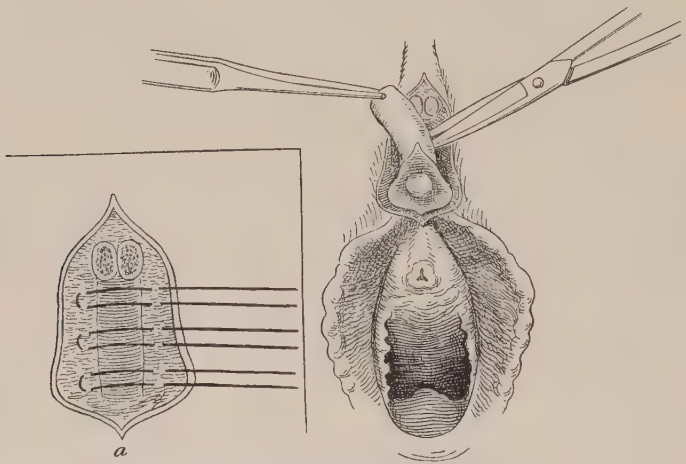


FIG. 922.—CLITORIDECTOMY—**Third Step.**
Illustration *a* shows the mattress sutures which control the bleeding in the vascular area.

Third Step.—The body of the clitoris is divided close to the crura and the organ excised from above downward. The divided end of the body is grasped by tissue forceps and the clitoris carefully dissected from its attachments by means of the dry dissector, the scalpel, and scissors (Fig. 922).

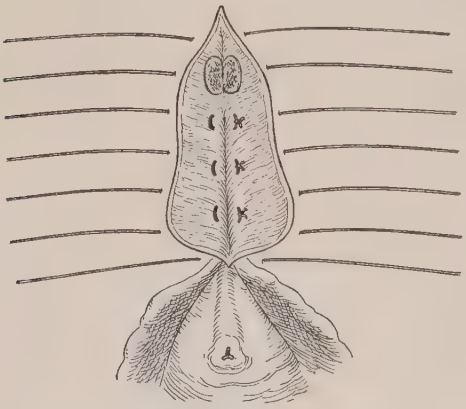


FIG. 923.—**Fourth Step.**

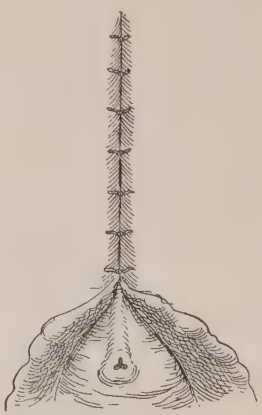


FIG. 924.—**Fourth Step.**

CLITORIDECTOMY.
Fig. 923 shows the method of introducing the sutures; note the three mattress sutures controlling hemorrhage in the vascular area; Fig. 924 shows the sutures tied.

Bleeding is controlled by means of hemostatic forceps and catgut ligatures. Excessive hemorrhage from the vascular area at the bottom of the wound often occurs and is readily checked by two or three mattress sutures of catgut.

Fourth Step.—The wound is closed by approximating its edges with deep silkworm-gut sutures which pass completely under the denuded area and include the bleeding vessels that have not been ligated (Figs. 923 and 924).

Fifth Step.—The parts are douched with corrosive sublimate solution (1 to 2000) and a gauze compress secured by a T-bandage placed over the wound.

After-treatment.—The dressings are changed once a day or oftener if they become soiled and the wound douched with a solution of corrosive sublimate (1 to 2000), followed by sterile water.

The stitches are removed on the eighth day and the patient allowed to get out of bed on the tenth day if all goes well.

EXCISION OF THE VULVA.

Definition.—The operation consists in the removal of a part or the whole of the vulva.

Position.—The patient is placed in the dorsal position with her feet held by Edebohls's leg-holders and stirrups.

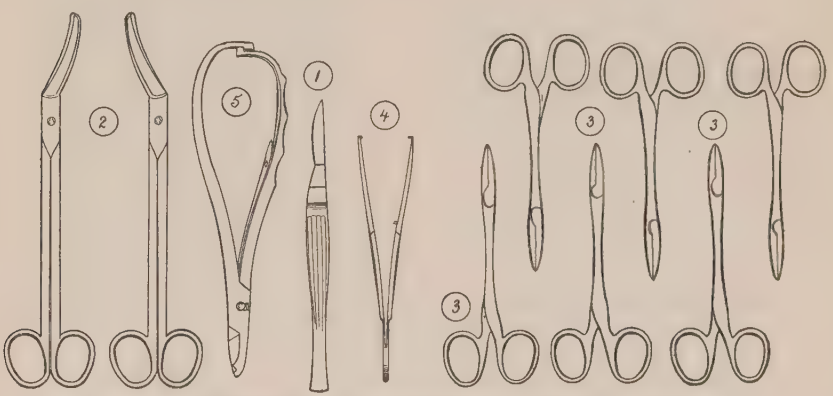


Fig. 925.—Instruments Used in the Operation of Excision of the Vulva.

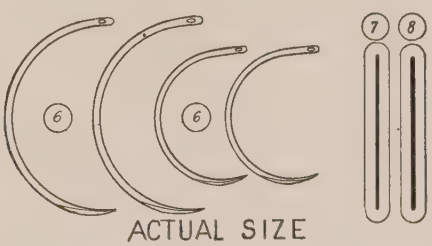


Fig. 926.—Needles and Suture Materials Used in the Operation of Excision of Vulva.

Number of Assistants.—An anesthetizer, two assistants, and a general nurse.

Instruments.—(1) Scalpel; (2) right and left Emmet's slightly curved scissors; (3) six hemostatic forceps; (4) rat-tooth tissue forceps; (5) needle-holder; (6) two small and two very small full-curved Hagedorn needles; (7) plain cumol catgut (No. 2, six envelopes); (8) silkworm-gut (30 strands).

Operation (*Complete Excision*).—**First Step.**—An incision is made completely around the vulva which converges at the anterior and posterior commissures and passes through the skin and underlying connective tissue. A circular incision is then made around the urinary meatus in order to protect the urethral opening and prevent the subsequent formation of a traumatic stricture (Fig. 927).

Second Step.—The structures within the lines of the incision are dissected from the underlying tissues and cut away at the margin of the orifice of the vagina (Fig. 928).

Third Step.—The lower end of the vagina is dissected up for a distance of an inch or more in order to loosen its attachments and pull it down as a flap to assist in covering the denuded surfaces when the wound is sutured (Fig. 929).

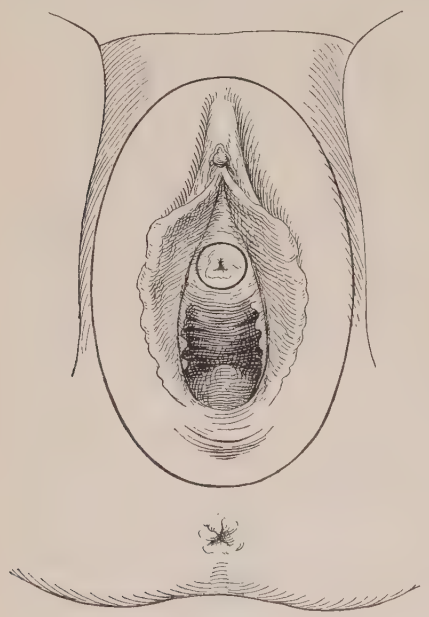


FIG. 927.—First Step.

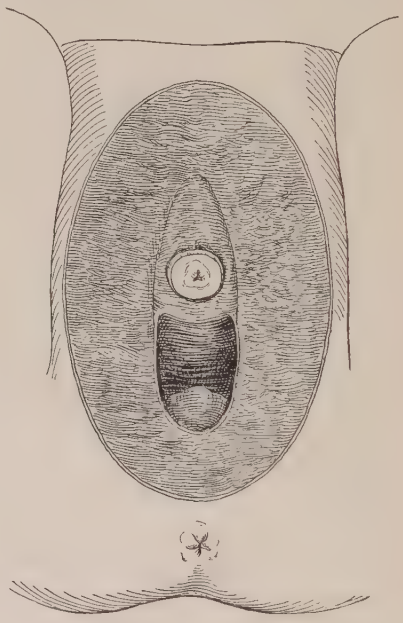


FIG. 928.—Second Step.

EXCISION OF THE VULVA.

Fig. 927 shows the preliminary incision made around the vulva and the external urinary meatus; Fig. 928 shows the raw surfaces left after the vulva has been excised.

Hemorrhage occurring during the operation is controlled by means of hemostatic forceps and catgut ligatures. Excessive bleeding from vascular areas in the wound is apt to occur and is readily checked by two or three mattress sutures of catgut.

Fourth Step.—The wound is closed by deep silkworm-gut sutures which pass under the denuded surfaces and include the bleeding vessels that have not been ligated. The edges of the wound should be approximated so as to produce the minimum amount of traction upon the sutures and prevent them from cutting. Fig. 930 shows how the edges of the wound are brought together and united by silkworm-gut.

Fifth Step.—The field of operation is douched with a solution of corrosive sublimate (1 to 2000) and a gauze compress secured by a T-bandage placed over the wound.

After-treatment.—The dressings are changed each time the bladder is emptied and the wound douched with a solution of corrosive sublimate (1 to 2000). The urine should be drawn with a catheter every eight hours dur-

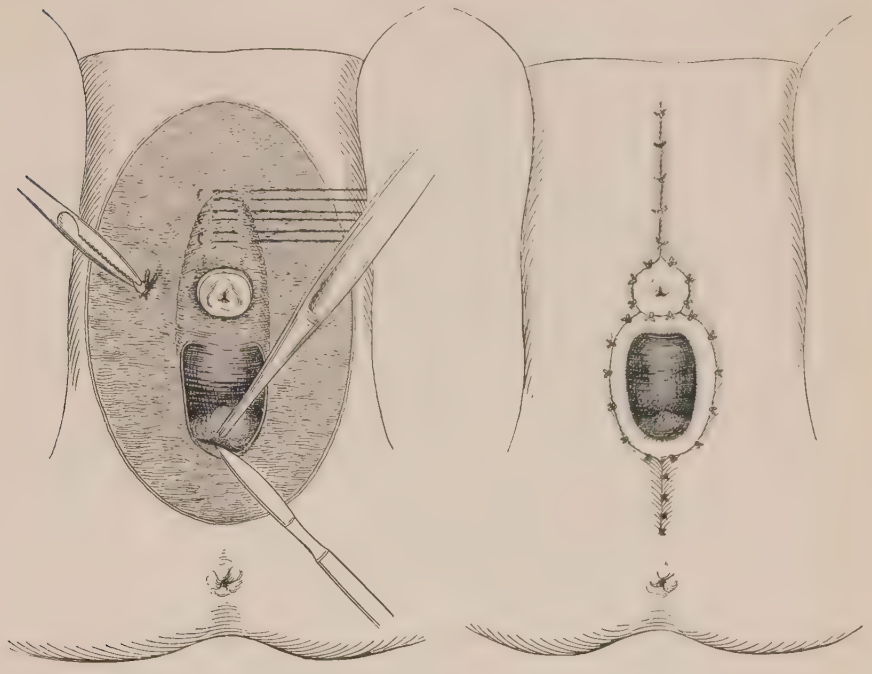


Fig. 929.—Third Step. Fig. 930.—Fourth Step.

Excision of the Vulva.

Note the mattress sutures in the vascular area and the lower end of the vagina being dissected from its attachments (Fig. 929).

ing the first three days in order to protect the field of operation and prevent the urine from coming in contact with the wound.

The stitches are removed on the eighth day, and if all goes well the patient is allowed to get out of bed at the end of the second week.

SUPRAPUBIC CYSTOTOMY.

Definition.—This operation consists in making an opening into the bladder above the symphysis pubis.

Preparation of the Patient.—The hair on the pubes and mons veneris is cut short and the lower abdomen, vulva, and adjacent parts thoroughly sterilized in the manner described under Minor and Abdominal Operations (see pp. 830 and 836).

A bottle of citrate of magnesia is given the evening before the operation, and on the following morning the rectum is flushed with a copious enema of soapsuds and water.

The interior of the bladder requires no special preparation unless it is indicated by the nature of the vesical lesion, in which case an irrigation of normal salt or boric acid solution is given every day for one week before the operation

(see p. 635 for the method of irrigating the bladder). The urine should be rendered bland and non-irritating by the administration of appropriate remedies and drinking large quantities of pure water.

Position.—The patient is placed in the Trendelenburg position at an angle of 25 degrees.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

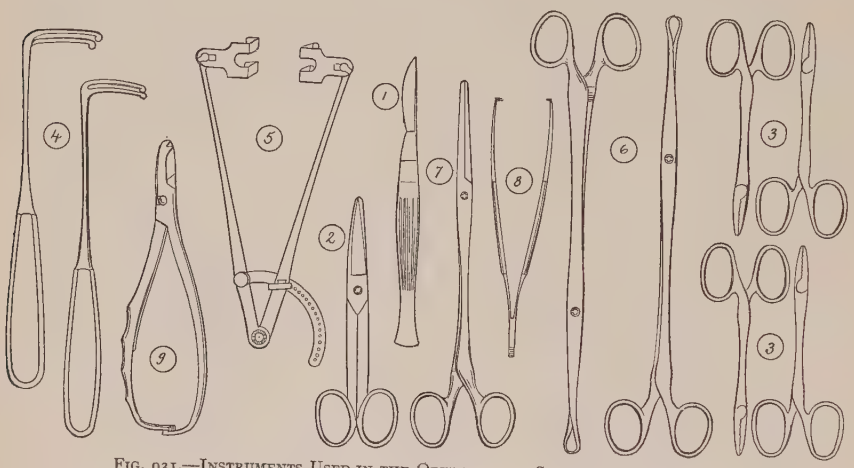


FIG. 931.—INSTRUMENTS USED IN THE OPERATION OF SUPRAPUBIC CYSTOTOMY.

FIG. 932.—NEEDLES AND SUTURE MATERIALS USED IN THE OPERATION OF SUPRAPUBIC CYSTOTOMY.

Instruments.—(1) Scalpel; (2) scissors; (3) four short hemostatic forceps; (4) abdominal retractors; (5) Ashton's self-retaining abdominal retractors; (6) two bullet forceps; (7) dressing forceps; (8) tissue forceps; (9) needle-holder; (10) two small full-curved Hagedorn needles; (11) two large curved Hagedorn needles; (12) two small curved intestinal needles; (13) No. 7 braided silk; (14) Nos. 1 and 2 plain cumol catgut, each four envelopes; (15) silkworm-gut—20 strands.

Operation.—First Step.—The bladder is distended by hydrostatic pressure. This is accomplished with the irrigating apparatus used in the treatment of contraction of the bladder (see p. 642) and a normal salt or boric acid solution. The catheter is introduced into the bladder and the reservoir held

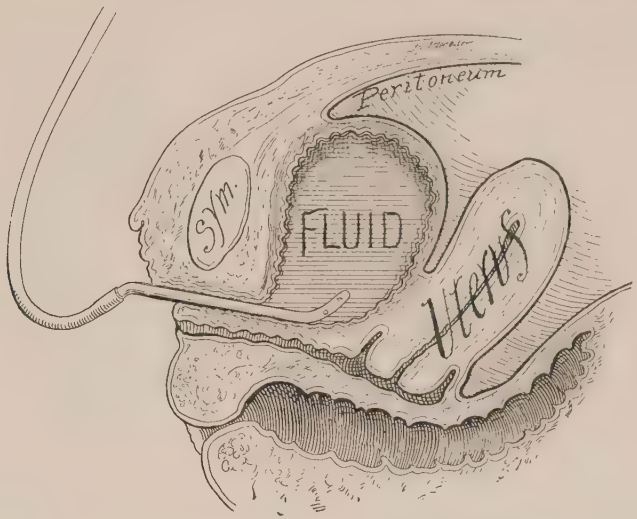


FIG. 933.—SUPRAPUBIC CYSTOTOMY—First Step.
Note the elevation of the peritoneum.

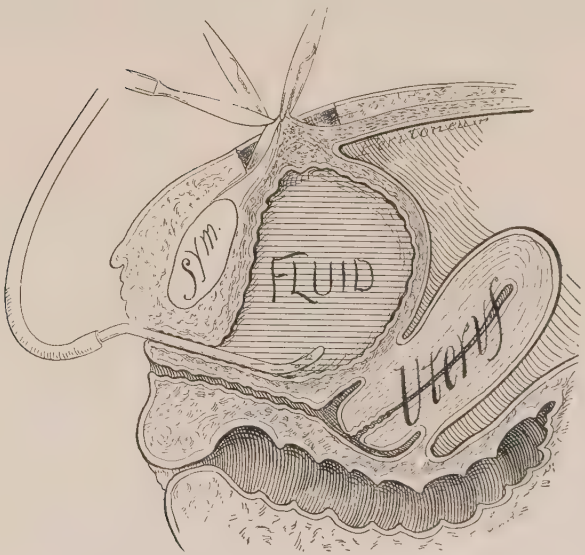


FIG. 934.—SUPRAPUBIC CYSTOTOMY—Second Step (page 968).
Showing the prevesical tissue being divided.

two or three feet above the patient. After the bladder is full the reservoir is kept elevated and the pressure of the solution causes continuous distention and elevates the peritoneum (Fig. 933).

Second Step.—A median incision is made, about 2½ inches or more in length, immediately above the pubes, through the skin, superficial fascia, muscles, and transversalis fascia, down to the loose areolar tissue covering the prevesical space. The peritoneal fold is then located near the symphysis pubis and pushed upward with the fingers off the bladder wall. The bladder is readily recognized by palpation as the hydrostatic pressure distends the organ, and it is felt as a round, tense, elastic tumor at the bottom of the wound.

The prevesical tissue is now picked up with two hemostatic forceps in the median line and the intervening structures carefully divided until the bladder is exposed to view. The wound is then retracted and the bleeding points controlled (Fig. 934).

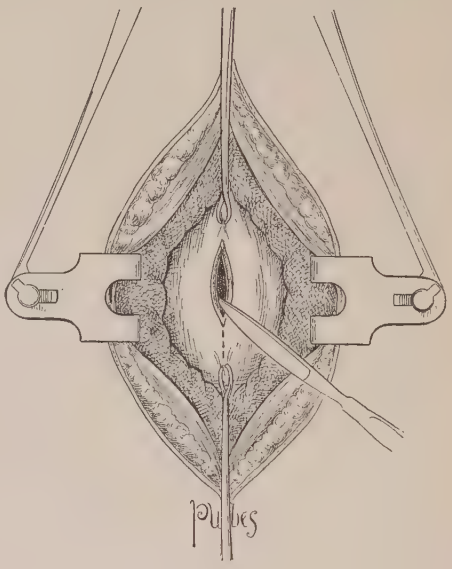


Fig. 935—Suprapubic Cystotomy—**Third Step.**

Third Step.—A bullet forceps is introduced across the median line through the muscular coat at the upper and lower limits of the exposed bladder and handed to the assistant. The surgeon then packs a strip of gauze in the prevesical space to protect the areolar tissue and opens the bladder between the forceps with a sharp scalpel.

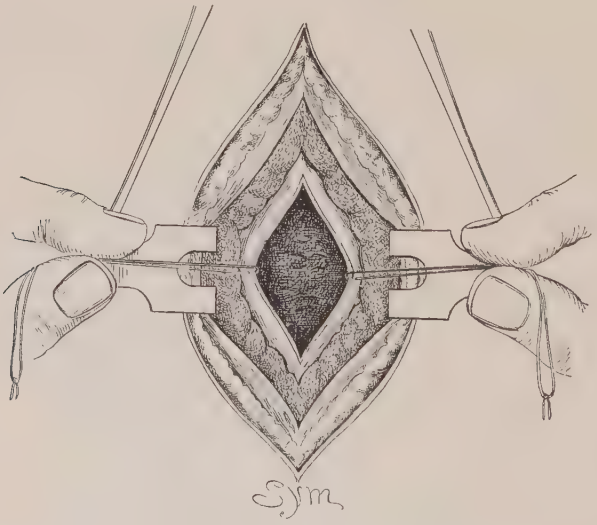


Fig. 936.—Suprapubic Cystotomy—**Fourth Step.**
Showing the bladder wound being held open by the traction sutures.

As the fluid escapes the assistant makes traction upon the bullet forceps and pulls the bladder well up into the abdominal wound (Fig. 935).

Fourth Step.—The irrigating reservoir is lowered below the level of the top of the table and the fluid drained from the bladder. A No. 7 braided silk suture is then passed through all the coats of the bladder at the middle of each edge of the opening and their free ends tied. The bullet forceps are now removed and the assistant holds the bladder wound open by the traction sutures. The surgeon then explores the bladder with his index-finger and increases the length of the opening if the nature of the vesical lesion requires more space for the operative manipulations (Fig. 936).

In some cases it may be necessary for the nurse to introduce two fingers into the vagina and lift the bladder upward and forward in order to bring the field of operation into view.

Fifth Step.—After the special indications for the operation have been carried out the wound in the bladder is closed and the abdominal incision sutured.

If the bladder is not infected or the operation unattended by severe trauma-

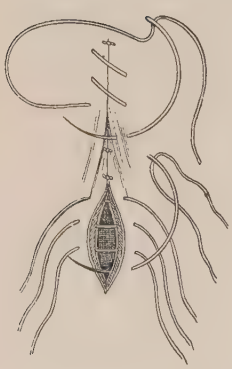


FIG. 937.—Fifth Step.

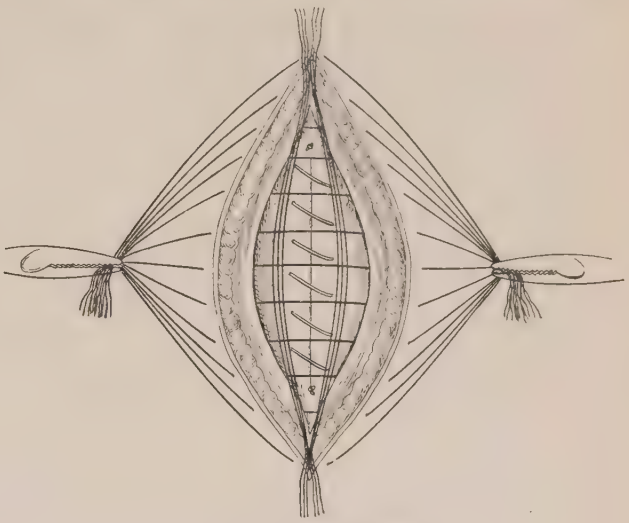


FIG. 938.—Fifth Step.

SUPRAPUBIC CYSTOTOMY.

Fig. 933 shows the method of introducing the two layers of sutures to close the bladder; Fig. 934 shows the bladder wound closed, the sutures introduced through the edges of the abdominal incision. and a few strands of silkworm-gut placed over the vesical wound.

tism, the vesical opening is closed at once by two layers of plain cumol catgut (No. 1). The first layer consists of a series of interrupted sutures which pass through all the coats of the bladder except the mucous, and the second of a continuous Lembert suture which is introduced in the same manner as when applied to an intestinal wound. A series of through-and-through sutures of silkworm-gut are now passed through the edges of the abdominal incision, and a few strands of the same suture material are placed over the vesical wound to drain the prevesical space and guard against leakage. The free ends of the silkworm-gut drain are then brought out at the upper and lower angles of the incision and the abdominal wall sutures tied. The abdominal dressings are applied in the usual manner (Figs. 937 and 938).

Variations in the Technic.—If the bladder is infected, the wound should be left open and its edges sutured to the parietes with plain catgut. The cavity of the bladder is flushed two or three times a day with one of the solutions

recommended in the local treatment of cystitis (see p. 635). The irrigation may be accomplished either through the urethra and the overflow allowed to pass out of the vesical opening, or it may be directed from above by means of a soft-rubber tube attached to an irrigating reservoir.

If a severe vesical hemorrhage occurs during the operation, it should be controlled by catgut sutures, the Paquelin cautery, or gauze packing. The latter method should be employed when the bleeding is profuse and time is an element of consideration. Under these circumstances a strip of gauze should be packed in the bladder and the vagina, and removed at the end of twenty-four hours. The packing should not be reintroduced unless the bleeding continues, in which case the bladder and vagina should be irrigated with hot normal salt or boric acid solution and fresh strips of gauze applied. In cases in which the bladder is tamponed the end of the strip of gauze is brought out of the vesical and abdominal wound and the latter is partly closed above and below with through-and-through sutures of silkworm-gut. The edges of the opening into the bladder are previously united to the bottom of the abdominal incision with a series of interrupted catgut sutures in order to shut off the prevesical space and prevent retraction occurring. After the tampon is removed the wound is packed with iodoform gauze and allowed to heal by granulation.

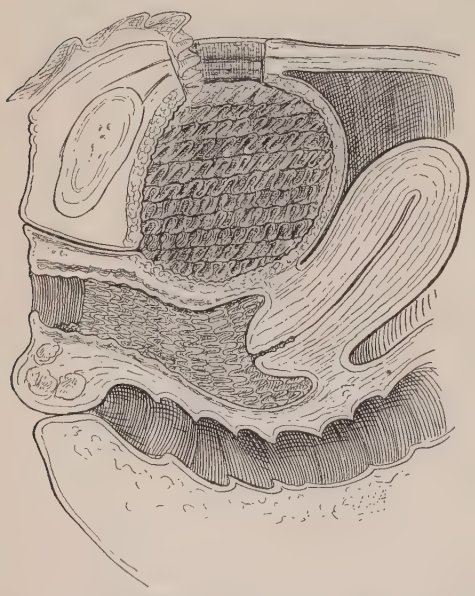


FIG. 939.—SUPRAPUBIC CYSTOTOMY. **Variations in Technic.** Shows the bladder and vagina packed with gauze to control vesical hemorrhage.

After-treatment. — If the abdominal incision is closed at the time of the operation, the stitches are removed on the eighth day and the wound dressed in the usual manner (see p. 848). In cases in which the wound is allowed to heal by granulation it should be dressed once a day by washing it with hydrogen peroxid and applying fresh gauze packing.

The urine should be drawn with a catheter every three hours for the first two days and then every eight hours unless it is voided spontaneously. A self-retaining catheter should not be employed as a routine practice, as it irritates the bladder and is likely to carry infection.

If it is necessary to irrigate the bladder in cases in which the vesical wound is closed, a double-current catheter should be employed (see p. 762), as the usual method of flushing may cause overdistention and tear out the stitches.

VAGINAL CYSTOTOMY.

Definition.—This operation consists in making an opening into the bladder through the vesicovaginal septum.

Preparation.—The preparation of the patient and the preparations for the operation are the same as given under Minor Operations on pages 830 and 831.

Position.—The patient is placed in the dorsal position.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Instruments.—(1) Simon's speculum (curved blade); (2) male lithotomy staff; (3) scalpel; (4) scissors; (5) two short hemostatic forceps; (6) tissue

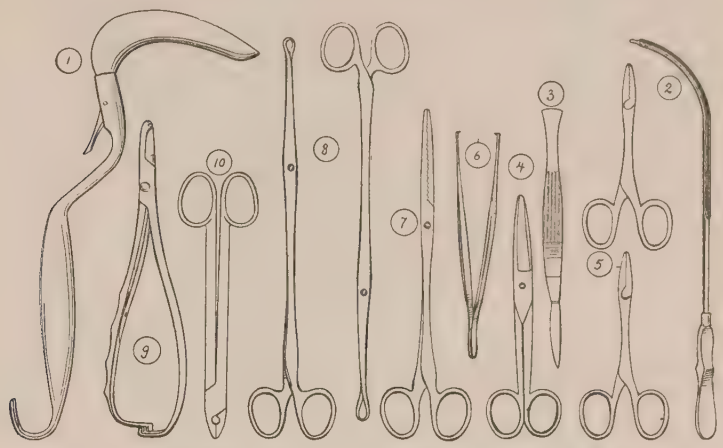


Fig. 940.—Instruments Used in the Operation of Vaginal Cystotomy.

forceps; (7) dressing forceps; (8) two bullet forceps; (9) needle-holder; (10) shot compressor; (11) perforated shot; (12) two straight and two slightly curved round-pointed needles; (13) silkworm-gut—twenty strands; (14) plain cumol catgut—No. 2, four envelopes.

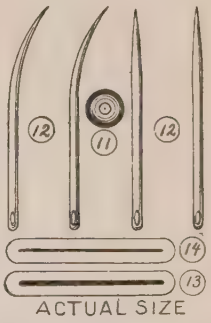


Fig. 941.—Needles, Suture Materials, and Perforated Shot Used in the Operation of Vaginal Cystotomy.

Operation.—First Step.—The perineum is retracted with the speculum and the staff introduced into the bladder. The anterior wall of the vagina is then depressed with the staff directly in the median line and an incision made along its groove through the vesicovaginal septum into the bladder with the scalpel (Fig. 942).

Second Step.—The staff is withdrawn, the index-finger passed into the bladder, and the incision enlarged if necessary with scissors, using the finger as a guide. The incision must always be made directly in the median line in order to keep clear of the ureters and guard against injuring them (Fig. 943).

Third Step.—After the indications for the operation have been carried out, the wound is either closed at once or left open if temporary drainage is required.

The technic of closing the incision is very simple and is the same as the operasion of a vesicovaginal fistula after the edges of the opening have been denuded (see p. 760).

If the incision is left open for temporary drainage, the raw edges must be covered over with mucous membrane, otherwise they will unite and close the artificial fistula. This is accomplished by drawing the vesical mucosa out through

the incision with tissue forceps and uniting it to the mucous membrane of the vagina by a series of interrupted catgut sutures (Fig. 944).

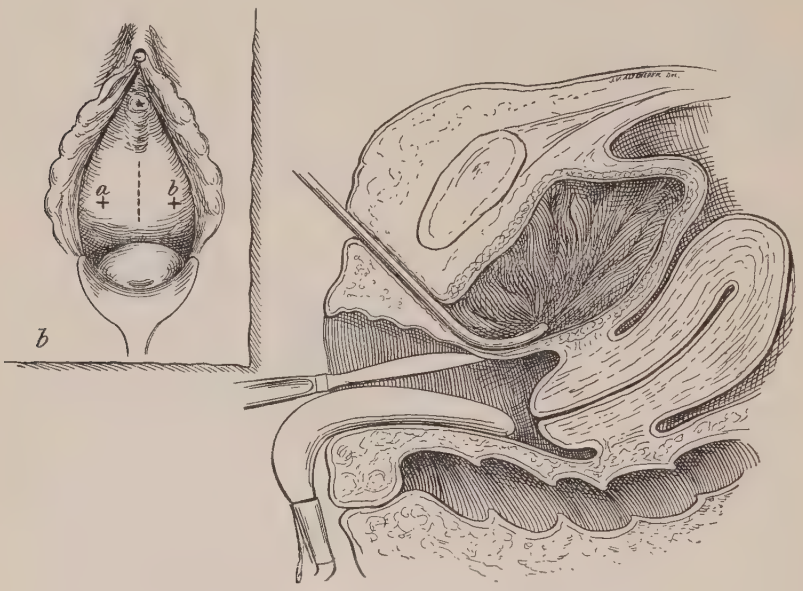


FIG. 942.—VAGINAL CYSTOTOMY—**First Step** (page 971).
Illustration *b* shows the position of the incision through the anterior vaginal wall (dotted line) and the situation of the orifices of the ureters (*a*, *b*).

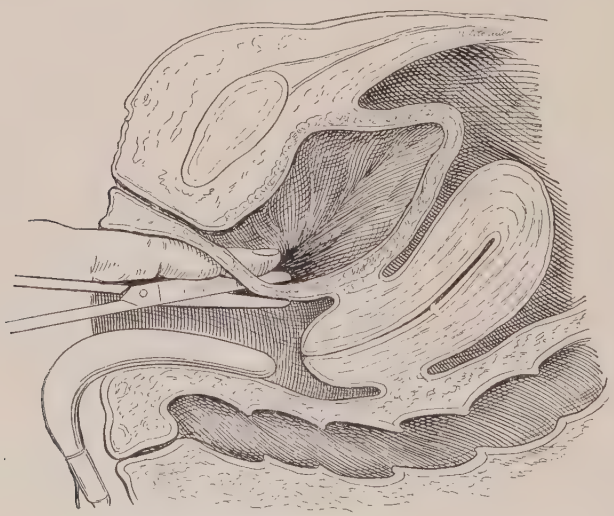


FIG. 943.—VAGINAL CYSTOTOMY—**Second Step** (page 971).

After-treatment.—The after-treatment is the same as in cases of vesicovaginal fistulas, in which the opening is either closed by an operation or left open on account of special reasons.

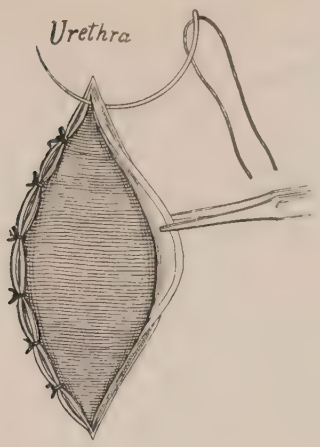


FIG. 944.—VAGINAL CYSTOTOMY—Third Step.

SALPINGO-OÖPHORECTOMY.

Definition.—This operation consists in removing the Fallopian tubes and the ovaries.

Position.—The patient is placed in the Trendelenburg position at an

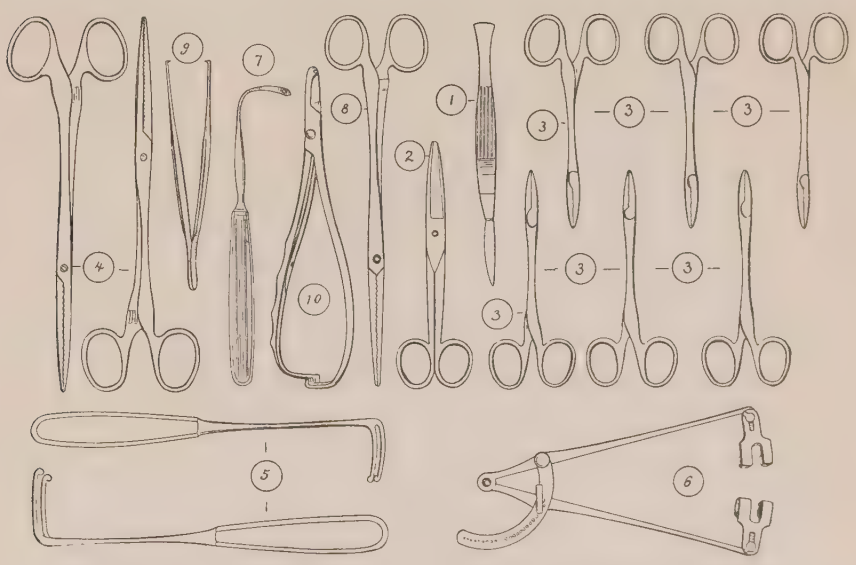


FIG. 945.—INSTRUMENTS USED IN THE OPERATION OF SALPINGO-OÖPHORECTOMY (page 974).

elevation of 25 degrees and subsequently raised to a higher angle during the operation if necessary.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Instruments.—(1) Scalpel; (2) blunt-pointed scissors; (3) six short hemostatic forceps; (4) two long-bladed hemostatic forceps; (5) a pair of abdominal retractors; (6) Ashton's self-retaining abdominal retractors; (7) pedicle needle; (8) dressing forceps; (9) rat-tooth tissue forceps; (10) needle-holder; (11) two small full-curved Hagedorn needles; (12) three long, straight, triangular-pointed needles; (13) braided silk—Nos. 2, 7, and 12; (14) plain cumol catgut—No. 2, four envelopes; (15) silkworm-gut—25 strands; (16) intestinal instruments and needles—Murphy's button; anastomosis forceps; clamps; two straight and two curved intestinal needles (Figs. 945 and 946).

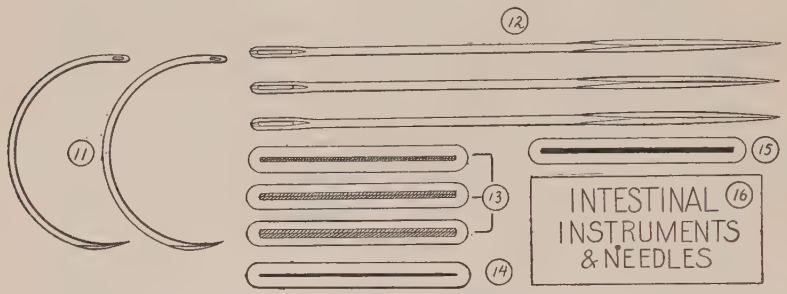


FIG. 946.—NEEDLES, SUTURE MATERIALS, AND INTESTINAL INSTRUMENTS AND NEEDLES USED IN THE OPERATION OF SALPINGO-OÖPHORECTOMY.

Operation.—First Step.—The index and middle fingers are passed into the pelvic cavity and the fundus of the uterus located by touch. The tips of the fingers are then carried laterally over the cornu of the uterus and along

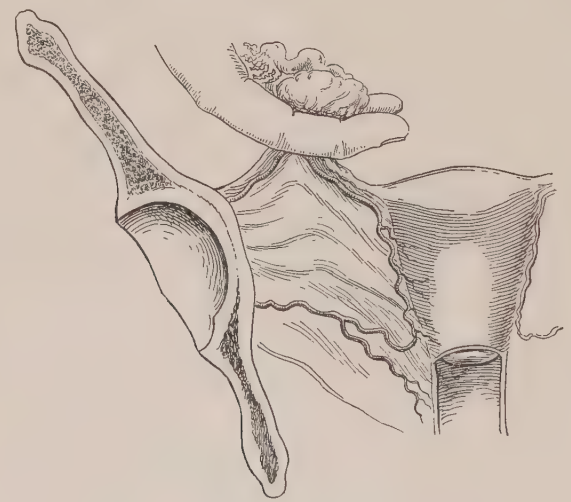


FIG. 947.—SALPINGO-OÖPHORECTOMY—**First Step.**

the posterior surface of the broad ligament until the tube and ovary are found. The superior margin of the broad ligament near the pelvic brim is now slipped between the fingers, and the ovary and tube hooked up into the incision (Fig. 947).

Second Step.—The pelvic end of the ovarian vessels is ligated by passing a pedicle needle threaded with No. 12 braided silk through the clear space in the

broad ligament below the artery and veins, and the ligature tied over the top of the infundibulo-pelvic ligament close to the pelvic brim and as far as possible from the fimbriated extremity of the tube. A second ligature is then passed

FIG. 948.—SALPINGO-OÖPHORECTOMY—**Second Step.**

through the broad ligament under the tube, the ovarian ligament, and the uterine end of the ovarian vessels, and tied over these structures as close as possible to the cornu of the uterus (Fig. 948).

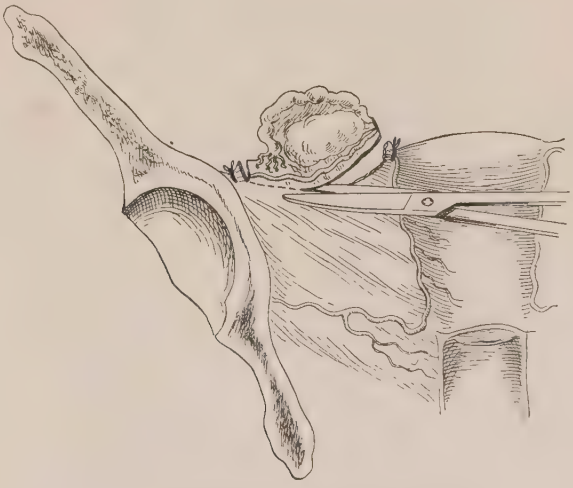


FIG. 949.—SALPINGO-OÖPHORECTOMY—**Third Step.**

Third Step.—The tube and ovary are removed by cutting them away with scissors between the pelvic and uterine ligatures and carrying the incision through the intervening portion of the broad ligament well under the hilum of the ovary.

Fourth Step.—The opening in the upper border of the broad ligament which

is left by the removal of the tube and ovary is closed with a continuous overhand suture of catgut (Fig. 950).

Fifth Step.—The tube and ovary on the opposite side are removed in a similar manner.

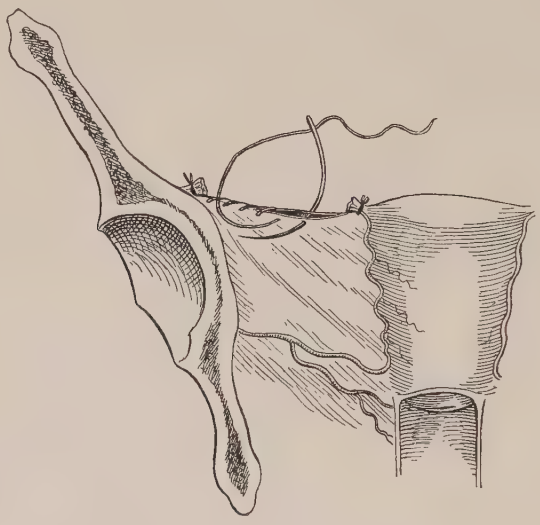


FIG. 950.—SALPINGO-OÖPHORECTOMY—**Fourth Step.**

FIG. 951.—SALPINGO-OÖPHORECTOMY. **Variations in the Technic.**
On the right side the vessels are shown ligated, and on the left the tube and ovary have been removed, sutures introduced to close the uterine wound, and the opening in the ligament is being closed.

Sixth Step.—A careful inspection of the field of operation is made to determine whether the pedicles are securely tied and whether there are any bleeding points requiring additional ligatures.

Variations in Technic.—The technic of salpingo-oöphorectomy is somewhat different from what has been described in cases of pyosalpinx, in which the tube is very friable and likely to be divided when the ligature at the uterine end of the broad ligament is tied. In these cases the ligature at the pelvic brim is first introduced and tied, and a second ligature passed at the uterine end of the broad ligament, which includes only the ovarian ligament and the ovarian vessels. This ligature is then tied, the structures beyond it cut away, and the tube resected by making a wedge-shaped incision into the cornu of the uterus. The edges of the uterine wound are finally brought together and sutured with catgut (Fig. 951).

When the broad ligament is tense or thickened by inflammatory deposits, it is often difficult or impossible to bring the ovary and tube into the incision and at the same time introduce both ligatures. Under these circumstances the ligature at the pelvic brim is first introduced and tied. The uterine end of the ligament is then clamped with forceps and the structures beyond the ligature

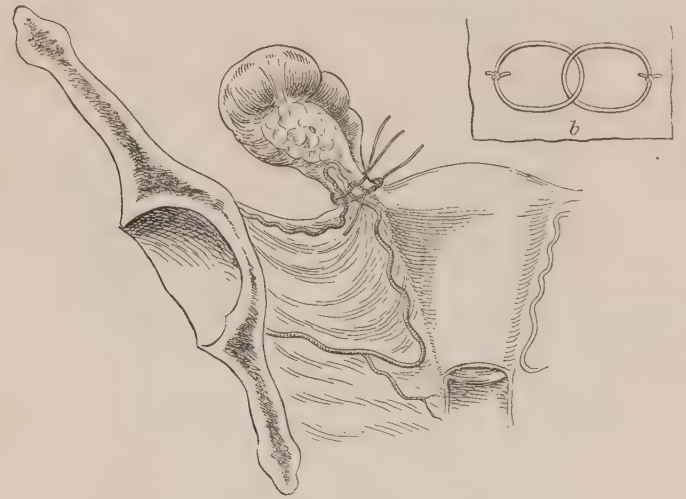


FIG. 952.—SALPINGO-OÖPHORECTOMY. **Variations in the Technic.**
Showing the interlocking suture which should not be employed to ligate the pedicle in salpingo-oöphorectomy; illustration *b* gives the details of the ligature.

at the pelvic brim cut away with scissors, carrying the incision along the upper margin of the broad ligament well below the hilum of the ovary. The tube and ovary, being thus freed from all their attachments except those near the uterus, are easily lifted into the abdominal wound and ligated in the usual manner.

The removal of the ovary and tube by an interlocking or link suture, which puckers up the broad ligament into a single thick pedicle including all the structures to be excised, should not be practised, as the method is surgically wrong and has no advantages whatever over the technic described above. The suture constricts an unnecessary amount of tissue and may cause a fatal hemorrhage, or a hematoma may form between the layers of the broad ligament from the retraction of a blood-vessel. It also produces undue tension of the broad ligament, and may be responsible at times for the pelvic pains which some women complain of after the tubes and ovaries have been removed. In cases in which the broad ligament is thickened or unyielding it is impossible to completely remove the ovaries and tubes with this ligature, as there is not sufficient room

to make a pedicle and some of the ovarian tissue is certain to be included in the stump.

Special Directions.—Before the ligatures are introduced at the pelvic and uterine ends of the broad ligament the surgeon should make a careful inspection of the clear space in order to be certain that all the large blood-vessels lie above the point selected for the passage of the pedicle needle, otherwise a post-operative hemorrhage may occur and the patient lose her life.

Although, as a rule, there is no bleeding from the upper edge of the ligament after the ovary and tube are removed, yet it is always best to suture the edges of the peritoneum in order to close the intraligamentous space and guard against the possibility of subsequent oozing.

REMOVAL OF A CYSTIC TUMOR OF THE OVARY.

Position.—The patient is placed in the Trendelenburg posture at an angle of 25 degrees, and subsequently raised to a higher elevation during the operation if necessary.

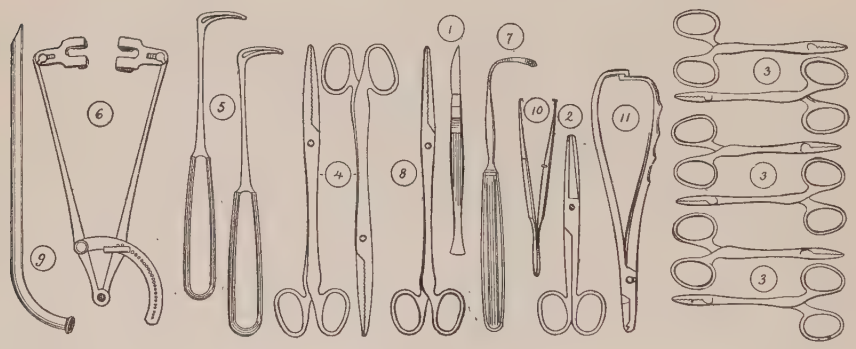


Fig. 953.—Instruments Used in the Operation for the Removal of a Cystic Tumor of the Ovary.

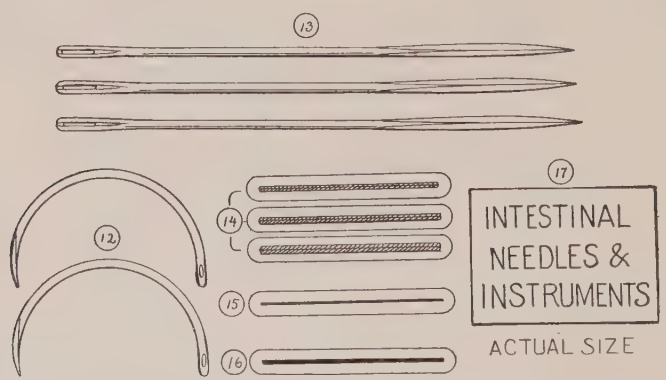


Fig. 954.—Needles, Suture Materials, and Intestinal Instruments and Needles Used in the Operation for the Removal of a Cystic Tumor of the Ovary.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Instruments.—(1) Scalpel; (2) blunt-pointed scissors; (3) six short hemostatic forceps; (4) two long-bladed hemostatic forceps; (5) a pair of abdominal retractors; (6) Ashton's self-retaining abdominal retractors; (7) pedicle needle; (8) dressing forceps; (9) a trocar with rubber tubing; (10) rat-tooth tissue forceps; (11) needle-holder; (12) two small full-curved Hagedorn needles; (13) three long, straight, triangular-pointed needles; (14) braided silk—Nos. 2, 7, and 12; (15) plain cumol catgut—No. 2, four envelopes; (16) silkworm-gut – 25 strands; (17) intestinal instruments and needles—Murphy's button; anastomosis forceps; clamps; two straight and two curved intestinal needles (Figs. 953 and 954).

Operation.—First Step.—So soon as the abdominal incision is made the index and middle fingers are passed through the opening in order to examine the surface of the cyst for the presence of adhesions, and if possible confirm the diagnosis (Fig. 955).

Second Step.—While the assistant makes lateral pressure over the abdomen the operator selects a point on the wall of the cyst that is free from blood-vessels

FIG. 955.—OPERATION FOR THE REMOVAL OF AN OVARIAN CYST—**First Step.**
Shows the tips of the fingers palpating the pedicle and determining the character of the tumor.

and plunges the trocar into its cavity. The fluid contents then escape through the trocar and rubber tubing into a bucket on the floor and the wall of the cyst gradually becomes flaccid. The wall of the cyst is now caught on each side of the trocar with long-bladed hemostatic forceps, and as the fluid escapes the cyst is gradually drawn out through the abdominal incision with the fingers or the hemostatic forceps. During the delivery of the sac the assistant keeps up pressure over the abdomen in order to facilitate the escape of the fluid through the trocar and force the cyst up toward the abdominal opening (Fig. 956).

Third Step.—When the sac is entirely delivered, the abdominal opening is protected with a gauze pad, the pedicle clamped with a long-bladed hemostatic forceps, and the cyst cut away (Fig. 957).

Fourth Step.—The pedicle is transfixed near the cornu of the uterus with a pedicle needle threaded with a double ligature of No. 12 braided silk, which is first tied as an interlocking suture, and then carried around so as to include the entire stump (Fig. 958).

Fifth Step.—The forceps are removed and the pedicle trimmed down to within half an inch of the ligatures. The peritoneal edges of the stump are

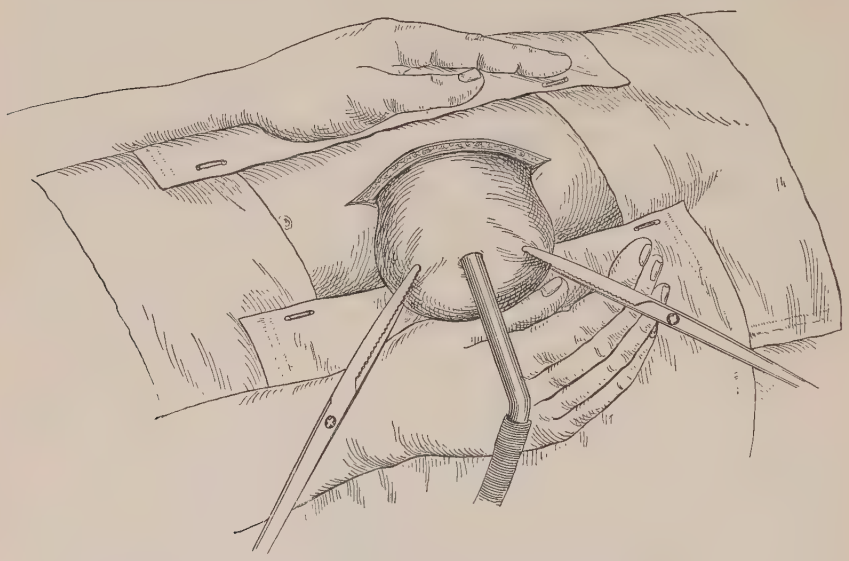


FIG. 956.—OPERATION FOR THE REMOVAL OF AN OVARIAN CYST—**Second Step** (page 979).

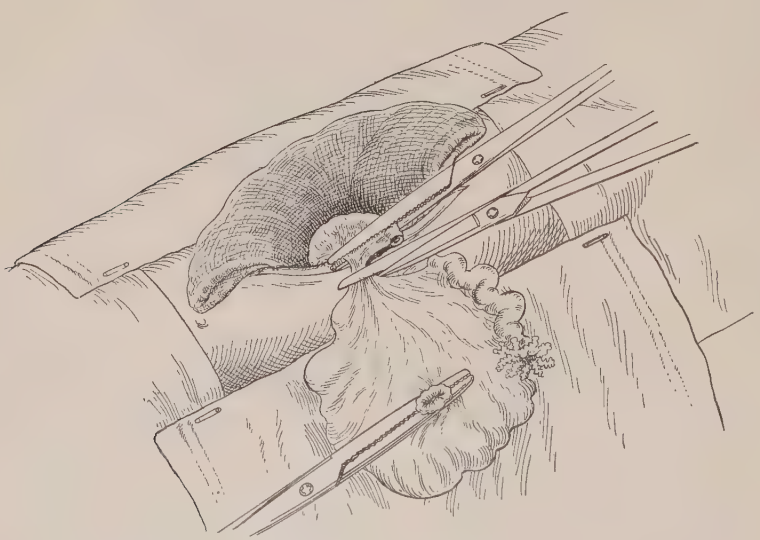


FIG. 957.—OPERATION FOR THE REMOVAL OF AN OVARIAN CYST—**Third Step** (page 979).

then inverted with tissue forceps and united with a continuous Lembert suture of No. 2 braided silk (Fig. 959).

Sixth Step.—The opposite ovary is examined and the field of operation carefully inspected before closing the abdomen.

Variations in Technic.—A suppurating or dermoid cyst should not be tapped, as its contents may escape into the abdominal cavity and infect the peritoneum. These cysts should, therefore, be delivered intact by enlarging the abdominal incision and gently forcing them through the opening.

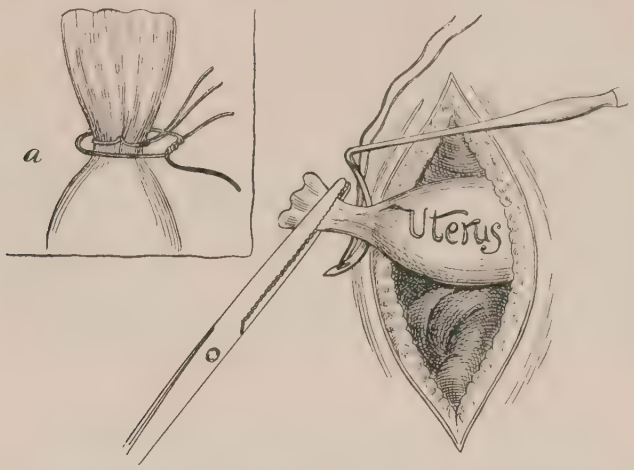


FIG. 958.—OPERATION FOR THE REMOVAL OF AN OVARIAN CYST—**Fourth Step** (page 979). Illustration *a* shows the method of applying the interlocking suture.

A multilocular cyst is more difficult to empty than one with a single sac, and it sometimes requires considerable judgment and skill upon the part of the operator to deliver it through a small incision. The cysts which are contained within the main sac can usually be punctured one after the other with the trocar and their contents drained away in the usual manner. The hand, however, should be passed into the abdominal cavity to direct the trocar and prevent it

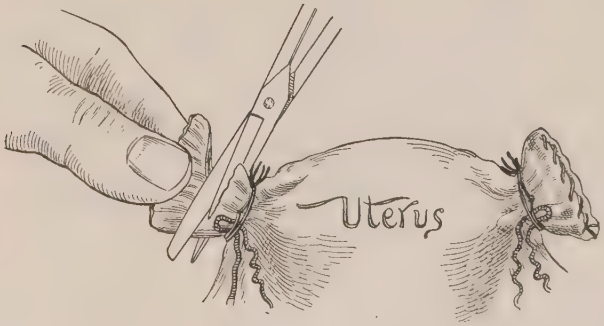


FIG. 959.—OPERATION FOR THE REMOVAL OF AN OVARIAN CYST—**Fifth Step** (page 980).

from puncturing the main sac. In some instances the cysts can be broken up by passing the index and middle fingers into the sac and rupturing their walls by direct pressure.

A semisolid cyst or one that is difficult to empty should be delivered by increasing the length of the incision, as the manipulations often do harm, and

should not be continued simply to avoid making a larger opening in the abdominal wall.

A broad fleshy pedicle should not be ligated *en masse* with an interlocking ligature, as there is always more or less danger of the ligature slipping and a fatal hemorrhage occurring. Under these circumstances a ligature should be passed at each end of the broad ligament and tied in the manner described under salpingo-oöphorectomy (see p. 977) and the raw edges in the upper aspect of the ligament which are left after the pedicle is cut away sutured with a continuous Lembert suture of No. 2 braided silk.

Special Directions.—Before tapping the cyst the surgeon should pass one or two fingers into the abdomen and explore the anterior surface of the tumor as far as possible. Unless this is done, anterior adhesions are likely to be overlooked and the delivery of the cyst complicated.

It is also important not to use force in delivering the cyst, as adhesions may be present between it and adjacent organs and a serious injury may result from rough manipulations. The surface of the sac should therefore be constantly inspected by sight and touch during its delivery, and if adhesions present themselves traction upon the cyst should be stopped at once until they have been separated and broken up in the manner described on page 910.

REMOVAL OF AN INTRALIGAMENTOUS CYST.

The *Position of the Patient*, the *Number of Assistants*, and the *List of Instruments* are the same as for the removal of a cystic tumor of the ovary (see p. 978).

Operation.—First Step.—The ovarian vessels are first ligated at the pelvic and uterine ends of the broad ligament and the surface of the cyst exposed by incising the peritoneum (Fig. 960).

The preliminary ligation of the ovarian vessels controls the circulation and

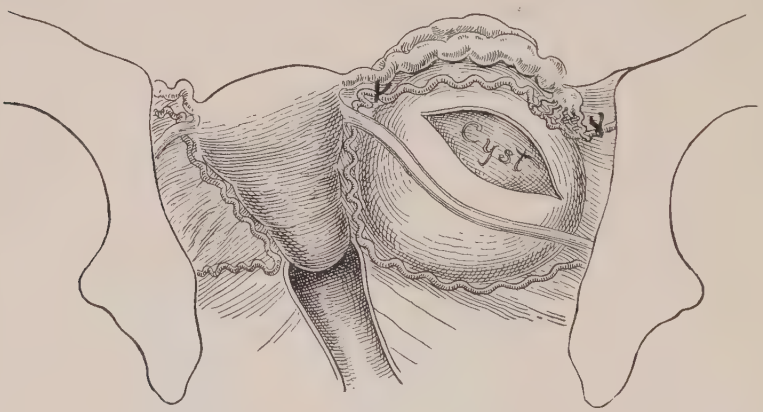


FIG. 960.—OPERATION FOR THE REMOVAL OF AN INTRALIGAMENTOUS CYST—**First Step.**

enables the operator to enucleate the cyst with but little, if any, bleeding. The incision through the peritoneum over the tumor should be made at a point in which there are the fewest number of blood-vessels, and care should be taken not to cut into the wall of the cyst.

Second Step.—The cyst is shelled out of the broad ligament by means of dry dissection, using for the purpose the handle of a scalpel, the tips of the

fingers, and a gauze sponge. Bleeding vessels are secured with hemostatic forceps and subsequently ligated with catgut after the enucleation of the cyst is completed (Fig. 961).

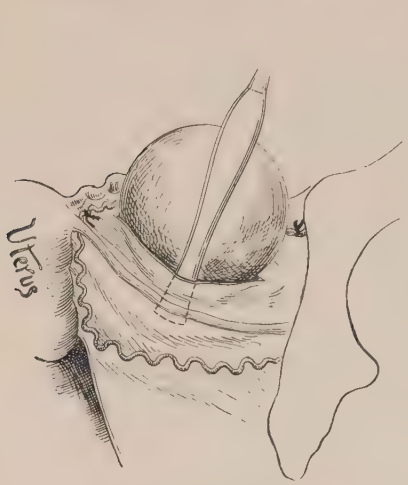


Fig. 961.—Second Step.

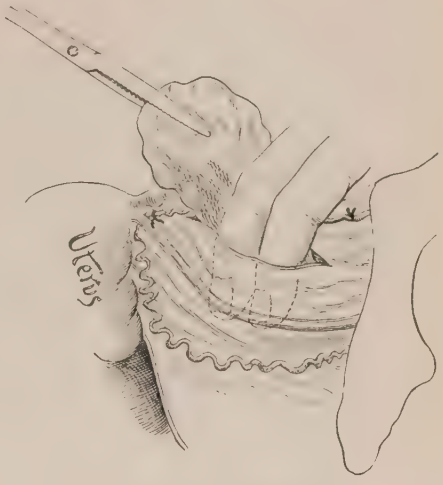


Fig. 962.—Second Step.

Operation for the Removal of an Intraligamentous Cyst.

Fig. 961 shows the enucleation of an unruptured cyst; Fig. 962 shows the enucleating of a cyst that has been tapped.

During the shelling-out of the cyst the operator should keep close to its walls in order to prevent tearing the broad ligament or injuring the underlying structures. When the cyst is large and crowds the pelvic cavity, it should be tapped with a trocar and the fluid evacuated before beginning the enucleation (Fig. 962).

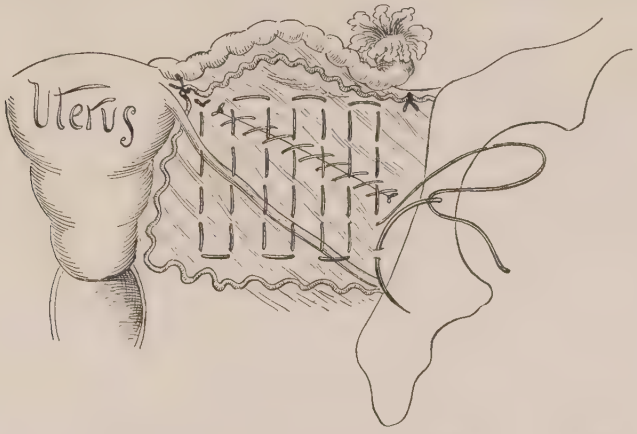


Fig. 963.—Operation for the Removal of an Intraligamentous Cyst—Third Step.

Shows the opening at the top of the broad ligament closed and the separated layers of the ligament being sutured.

In some cases it is even necessary to perform a preliminary tapping before the ovarian vessels can be ligated, as the pelvis is so crowded that it is impossible to find them until the contents of the sac have been removed.

Third Step.—The bleeding vessels are ligated and the hemostatic forceps removed. The layers of the broad ligament which were separated by the cyst are then united by continuous catgut sutures and the edges of the peritoneum at the top of the ligament closed in the same manner (Fig. 963).

In some cases the oozing from the raw surfaces between the folds of the broad ligament cannot be entirely checked and a hematoma is likely to form if the wound is closed. Under these conditions the broad ligament is attached to the lower angle of the abdominal incision by interrupted catgut sutures which include the edges of the opening in the ligament and pass through the peritoneum, muscle, and aponeurotic fascia of the abdominal wall. The cavity in the broad ligament is then packed with a strip of gauze and its end left outside of the abdominal wound.

Special Directions.—So soon as the abdomen is opened the surgeon should introduce his fingers into the abdominal cavity and thoroughly examine the relations of the cyst with adjacent structures.

In some cases it may be impossible to remove the base of the cyst when it is situated deeply in the pelvis, and under these circumstances the shelled-out portion should be cut away and the rest of the sac allowed to remain. The edges of the opening in the broad ligament are then sutured to the abdominal incision and the space between the folds of the ligament packed with a strip of gauze.

INCOMPLETE ABDOMINAL HYSTERECTOMY.

Definition.—This operation is performed by the abdominal route, and consists in the amputation of the uterus at the juncture of the body and the cervix.

Synonyms.—Supravaginal amputation of the uterus; Partial hysterectomy.

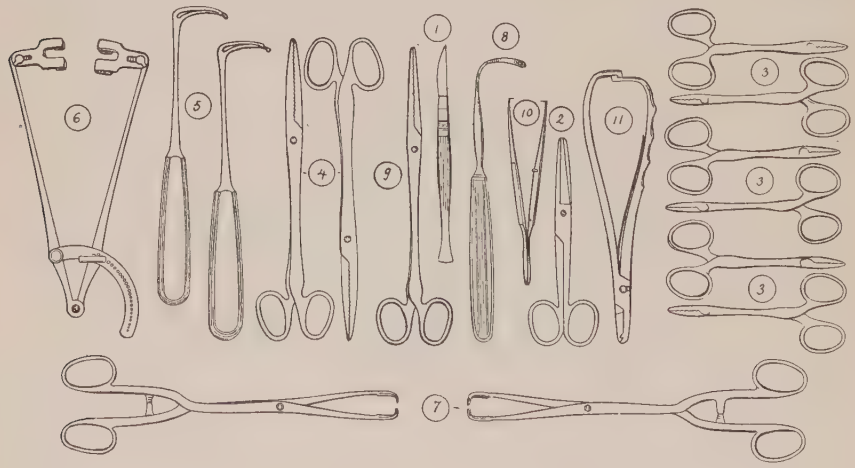


Fig. 964.—Instruments Used in the Operation of Incomplete Abdominal Hysterectomy.

Position.—The patient is placed in the Trendelenburg position with her body at an angle of 25 degrees, and after the abdomen is opened the pelvis is raised to 45 degrees.

Number of Assistants. — An anesthetizer, one assistant, and a general nurse.

Instruments.—(1) Scalpel; (2) blunt-pointed scissors; (3) six short hemostatic forceps; (4) two long-bladed hemostatic forceps; (5) a pair of abdominal retractors; (6) Ashton's self-retaining abdominal retractors; (7) two

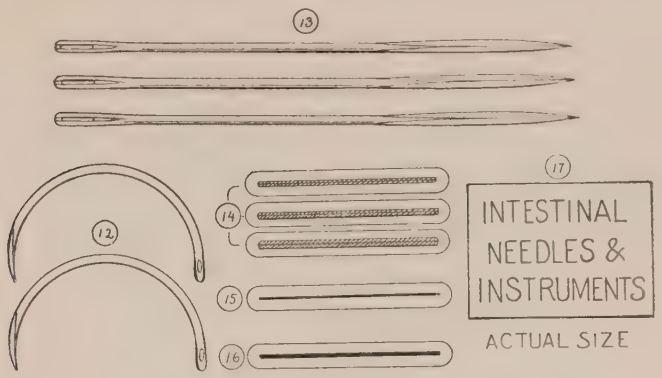


FIG. 965.—NEEDLES, SUTURE MATERIALS, AND INTESTINAL INSTRUMENTS AND NEEDLES USED IN THE OPERATION OF INCOMPLETE ABDOMINAL HYSTERECTOMY.

heavy hysterectomy traction forceps; (8) pedicle needle; (9) dressing forceps; (10) rat-tooth tissue forceps; (11) needle-holder; (12) two small full-curved Hagedorn needles; (13) three long, straight, triangular-pointed needles; (14) braided silk—Nos. 2, 7, and 12; (15) plain cumol catgut—No. 2, four envelopes; (16)

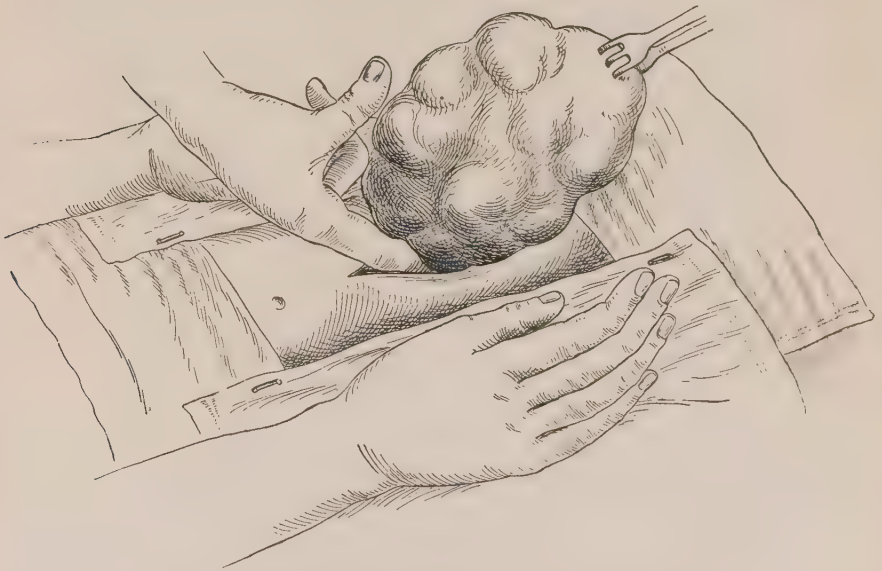


FIG. 966.—INCOMPLETE ABDOMINAL HYSTERECTOMY—Second Step (page 986).

silkworm-gut—40 strands; (17) intestinal instruments and needles—Murphy's button; anastomosis forceps; clamps; two straight and two curved intestinal needles (Figs. 964 and 965).

Operation.—First Step.—So soon as the abdomen is opened the surgeon introduces his hands into the cavity and ascertains the nature of the tumor; the thickness of the supravaginal cervix; the presence or absence of adhesions; and the relation of the neoplasm with adjacent organs. The abdominal incision is then enlarged sufficiently to allow the tumor to be delivered without using undue force.

Second Step.—The tumor is delivered through the abdominal incision by seizing it with a pair of heavy hysterectomy forceps and making traction upon it. At the same time the assistant makes lateral pressure upon the abdominal walls and the surgeon guides the passage of the tumor with one or two fingers introduced into the upper angle of the incision (Fig. 966).

Third Step.—The assistant pulls the tumor toward the symphysis pubis and the operator places two large gauze pads over the intestines immediately back

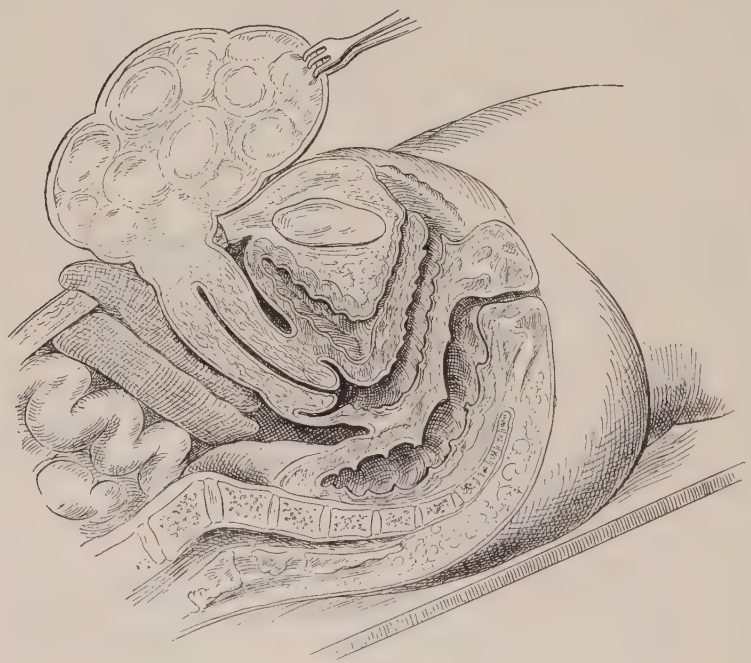


Fig. 967.—Incomplete Abdominal Hysterectomy—**Third Step.**

of the supravaginal cervix to shut off the field of operation and protect the general peritoneal cavity (Fig. 967).

Fourth Step.—A long-bladed hemostatic forceps is placed close to the cornu of the uterus, and the ovarian ligament, the Fallopian tube, the round ligament, and the uterine end of the ovarian vessels securely clamped. A single ligature of braided silk, No. 12, is passed through the broad ligament under the ovarian vessels and the round ligament and carried over the upper border of the infundibulo-pelvic ligament and tied near the fimbriated extremity of the tube. The broad ligament is then divided in an oblique direction downward between the fimbriated extremity of the tube and the ligature, toward the juncture of the body of the uterus and the cervix, close to the uterine artery and veins.

The forceps and ligature are then applied on the opposite side of the uterus and the broad ligament divided in the same manner (Fig. 968).

The uterus is now free on both sides down to the level of the vaginal junction.

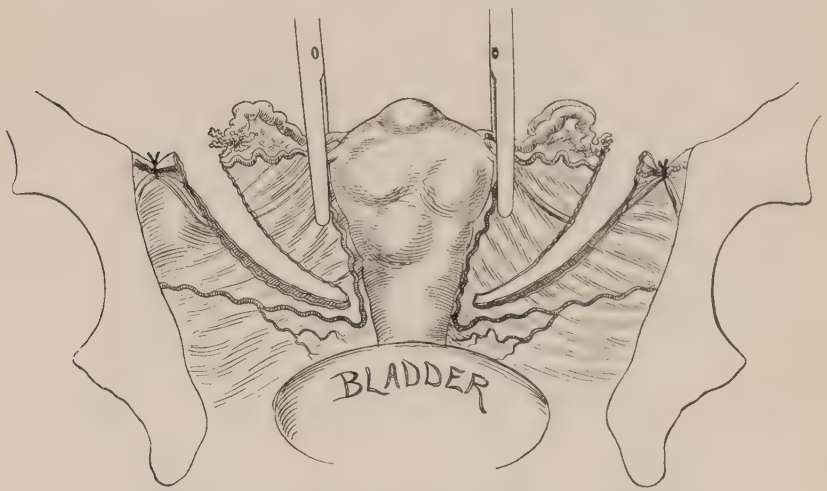


FIG. 968.—INCOMPLETE ABDOMINAL HYSTERECTOMY—**Fourth Step.**

Fifth Step.—The uterus is drawn over to one side and the opposite uterine artery and veins are ligated close to the cervix, with No. 12 braided silk passed through the tissues in a pedicle needle (Fig. 969).

The same procedure is then repeated on the opposite side.

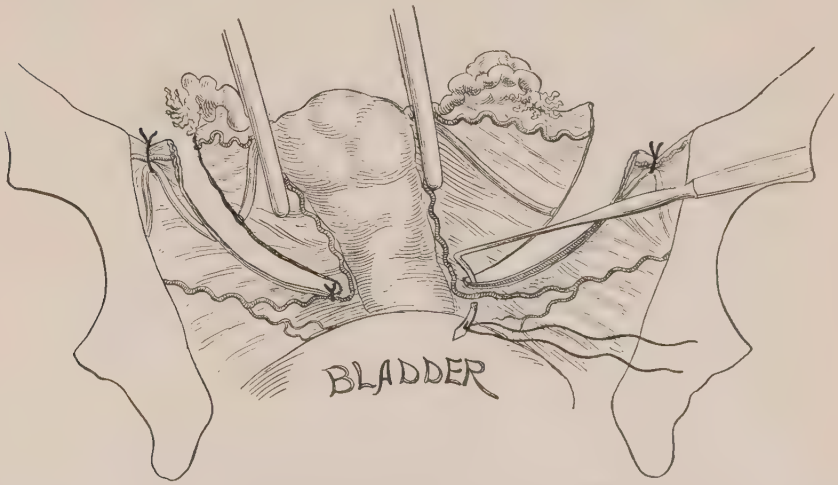


FIG. 969.—INCOMPLETE ABDOMINAL HYSTERECTOMY—**Fifth Step.**
Note that the uterine artery has been ligated on the right side of the uterus.

Sixth Step.—The tumor is drawn backward and upward, and the uterovesical reflection of the peritoneum put upon the stretch. An incision is then made across the peritoneum just above the uterovesical reflection and carried in a

curved direction to each side of the uterus, where it becomes continuous with the lateral divisions in the broad ligaments (Fig. 970).

Seventh Step.—The bladder is stripped from the uterus by pushing it with the fingers or the handle of a scalpel until it is completely separated down to the vaginal junction and the level of the lateral divisions of the broad ligaments (Fig. 971).

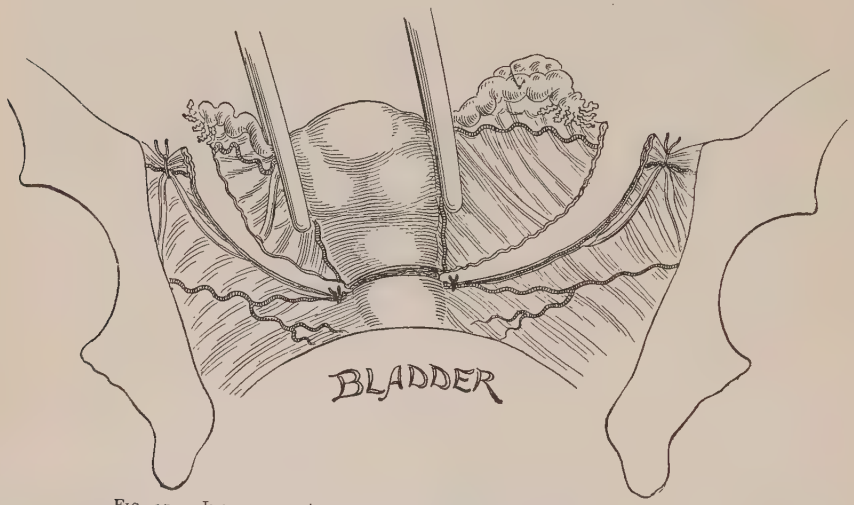


FIG. 970.—INCOMPLETE ABDOMINAL HYSTERECTOMY—**Sixth Step** (page 987).

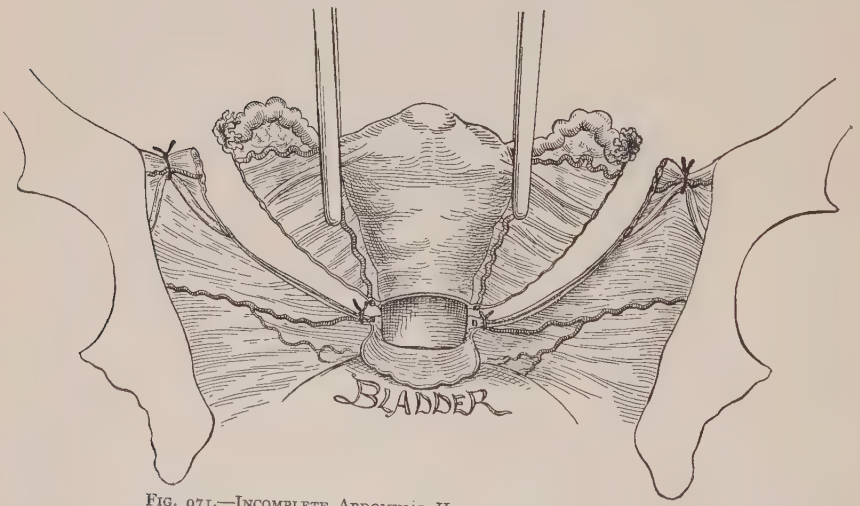


FIG. 971.—INCOMPLETE ABDOMINAL HYSTERECTOMY—**Seventh Step.**

Eighth Step.—The operator draws the tumor upward and amputates the uterus at the vaginal junction on a level with the ligatures controlling the uterine vessels (Fig. 972).

Ninth Step.—A ligature of No. 12 braided silk is passed close to the cervix under the pedicle which includes the uterine vessels, carried through the broad

ligament above the upper pedicle, and securely tied. The procedure is repeated on the opposite side of the cervix. The two pedicles on each side of the pelvis

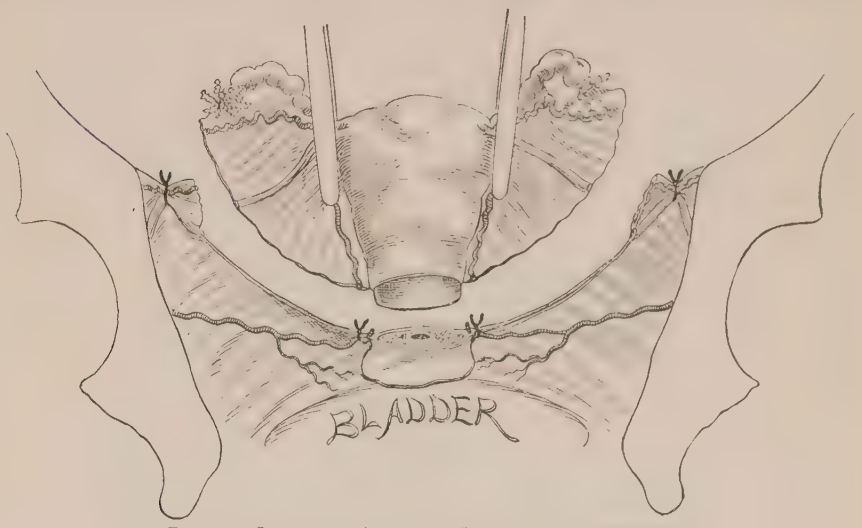


FIG. 972.—INCOMPLETE ABDOMINAL HYSTERECTOMY—**Eighth Step.**

are now united and the broad ligament made sufficiently tense to act as a future support to the vault of the vagina (Fig. 973).

Tenth Step.—The anterior flap of peritoneum is united by a continuous overhand suture of No. 2 plain cumol catgut to the peritoneal margin at the

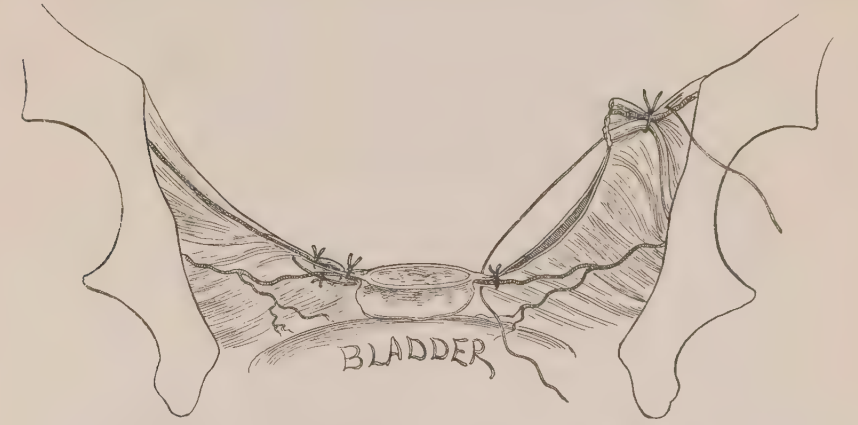


FIG. 973.—INCOMPLETE ABDOMINAL HYSTERECTOMY—**Ninth Step.**
On the right side of the cervix the pedicles are united and the ligature tied; on the left side is shown the method of passing the ligature.

posterior aspect of the cervical stump. The united stumps of the pedicles on each side of the cervix are then turned under the peritoneum and permanently buried beneath it by a continuous suture of catgut (Fig. 974).

Variations in Technic.—Tumors which are limited to the body of the uterus are readily delivered through the abdominal incision, and the broad ligaments, as a rule, are relaxed and more or less elongated. In these cases I am in the habit of varying the usual technic, and control the circulation with

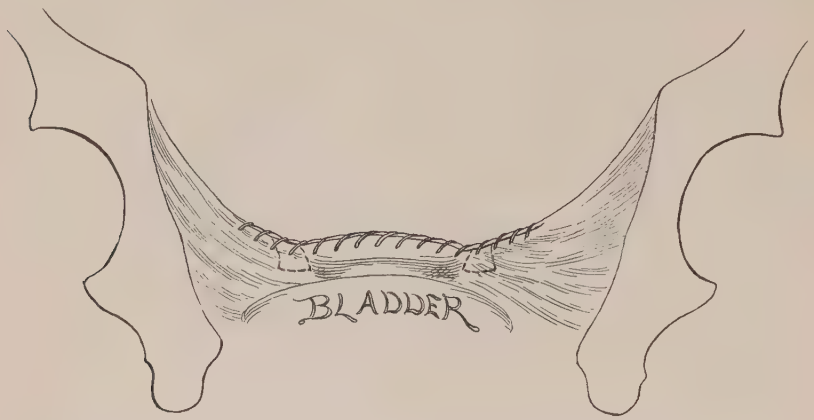


FIG. 974.—INCOMPLETE ABDOMINAL HYSTERECTOMY—**Tenth Step** (page 989).
Note that all the raw surfaces are covered with peritoneum and the stumps of the pedicles buried.

only one ligature on each side of the uterus, instead of ligating the ovarian and uterine vessels separately. I pass a No. 12 braided silk ligature, carried in a pedicle needle, through the base of the broad ligament close to the cervix and include the uterine vessels. The free ends of the ligature are then passed over

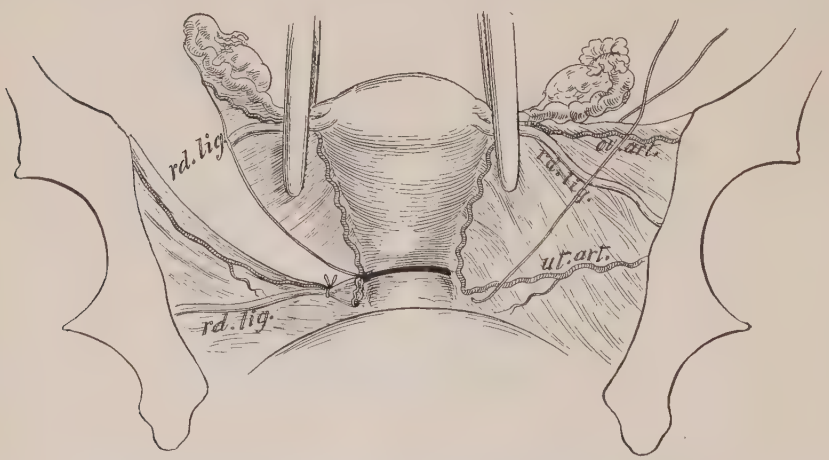


FIG. 975.— INCOMPLETE ABDOMINAL HYSTERECTOMY. **Variations in the Technic.**
Shows Ashton's method of ligating each broad ligament with a single ligature. On the right side the ligature is tied and the broad ligament divided, and on the left the method is shown of passing the ligature.

the upper margin of the infundibulo-pelvic ligament and tied near the fimbriated extremity of the tube. The ligature thus applied includes the uterine and ovarian vessels and the broad and round ligaments, and completely controls the circulation. The broad ligament is now divided obliquely downward, between the

ligature and the fimbriated extremity of the tube, to the vaginal junction. The procedure is then repeated on the opposite side and the succeeding steps of the operation carried out in the same manner as already described (Fig. 975).

When the tumor involves the supravaginal cervix, or it is firmly fixed in the pelvis, it is sometimes difficult or impossible to lift it out of the abdomen and secure the blood-vessels in the usual manner. Under these circumstances the abdominal incision is enlarged in order to freely expose the field of operation, and the ovarian vessels controlled by placing a long-bladed hemostatic forceps close to the cornu of the uterus and a ligature at the pelvic end of the broad ligament. The broad ligament is then divided as usual and the procedure repeated on the opposite side. The tumor, being now freed from its lateral

Fig. 976.—Shows the Method of Recognizing an Upward Displacement of the Bladder by a Large Fibroid Tumor of the Uterus.

attachments, can readily be delivered through the abdominal incision and the succeeding steps of the operation carried out as described above.

In a woman who is under forty-five years of age the ovaries should not be removed if they are healthy, for the reason that if they are allowed to remain in the pelvis the nervous symptoms of the artificial climacteric are prevented and the general condition of the patient is more satisfactory.

Special Directions.—In large tumors the danger of wounding the bladder when the abdomen is opened must always be borne in mind, and the incision should therefore be made nearer the umbilicus than the pubes, as the neoplasm may have lifted the organ out of the pelvis. The position of the bladder can be determined prior to operation by introducing a sound and locating it by feeling the tip of the instrument through the abdominal walls (Fig. 976).

A tumor of the body of the uterus associated with subperitoneal growths is difficult at times to deliver, owing to the irregularity of its surface, and under these circumstances it may be necessary to enlarge the abdominal opening unless the neoplasm can be drawn through the incision by manipulating it in different directions.

In some cases the tumor may be wedged in the pelvis and cannot be dislodged when traction is made upon it. To overcome this difficulty the operator inserts two fingers between the tumor and the posterior pelvic wall and moves them about in various directions in order to break the wedge and release the growth.

The location of the uterine artery can be readily felt by pressing the tissues between the tip of the thumb and the finger at the side of the cervix and recognizing the pulsations of the vessel. This manipulation should always be carried out before and after the introduction of the ligature in order to be certain that the artery is included and that it has not slipped beyond the bite of the pedicle needle. The needle should pass as close as possible to the uterus, without, however, taking up any of the cervical tissue, and care must always be taken not to include the ureter, which lies to the outer side of the uterine artery.

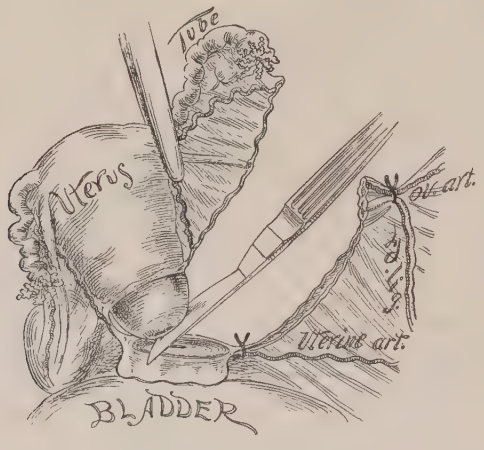


FIG. 977.—OPERATION FOR THE REMOVAL OF AN INTRALIGAMENTOUS UTERINE FIBROID ON ONE SIDE. (MODIFIED FROM KELLY.)—First Step.

In dividing the tissues beyond the ligatures in the broad ligaments the stumps must be left long enough to prevent retraction and slipping, otherwise a serious hemorrhage will result and the operation will be seriously complicated.

Before the cervical stump is covered by the anterior flap of peritoneum the surgeon must thoroughly inspect the entire field of operation and secure all bleeding points with catgut or introduce an additional silk ligature at each side of the cervix.

An Intraligamentous Uterine Fibroid on One Side.—The application of the forceps to the side of the uterus, the ligation of the ovarian vessels and the round ligament, the division of the broad ligament obliquely downward close to the vaginal junction, and the ligation of the uterine artery on the free side, as well as the separation of the bladder from the uterus, are accomplished in the same manner as described in the typical operation of Incomplete Abdominal Hysterectomy.

The succeeding steps of the operation, however, are different, and are carried out as follows:

First Step.—The uterus is forcibly pulled upward and drawn toward the opposite side and amputated at the vaginal junction (Fig. 977).

Second Step.—Strong traction is made upon the uterus upward and laterally, the uterine artery clamped with two hemostatic forceps, and divided between them (Fig. 978).

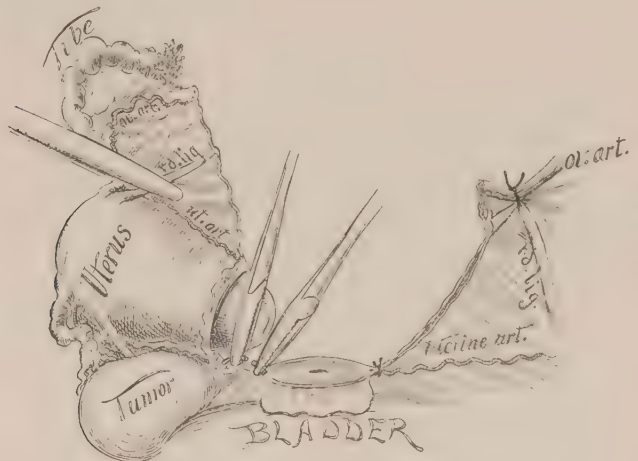


FIG. 978.—OPERATION FOR THE REMOVAL OF AN INTRALIGAMENTOUS UTERINE FIBROID ON ONE SIDE. (MODIFIED FROM KELLY.)—Second Step.

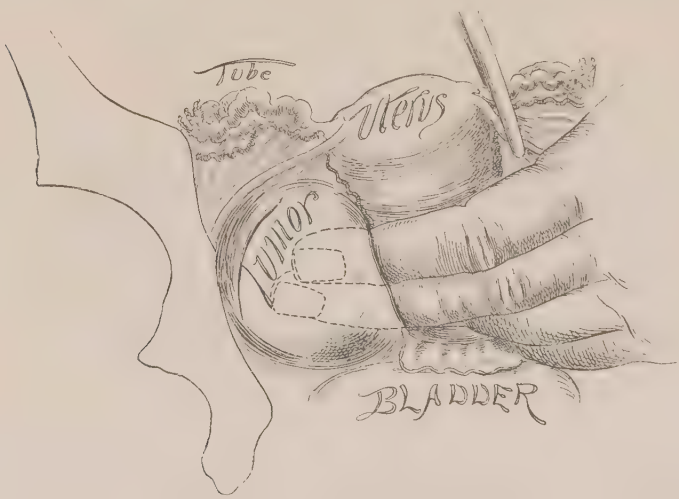


FIG. 979.—OPERATION FOR THE REMOVAL OF AN INTRALIGAMENTOUS UTERINE FIBROID ON ONE SIDE—Third Step.

There is no difficulty, as a rule, in locating the uterine artery, as it is generally exposed to view beneath the intraligamentous growth so soon as the last fibers of the cervix are divided.

Third Step.—The base of the broad ligament is stretched apart with the fingers and the tumor enucleated from its bed (Fig. 979).

Fourth Step.—A ligature is passed through the broad ligament, under the round ligament, and tied over the upper margin of the infundibulo-pelvic ligament near the Fallopian tube. The broad ligament is now divided down to the

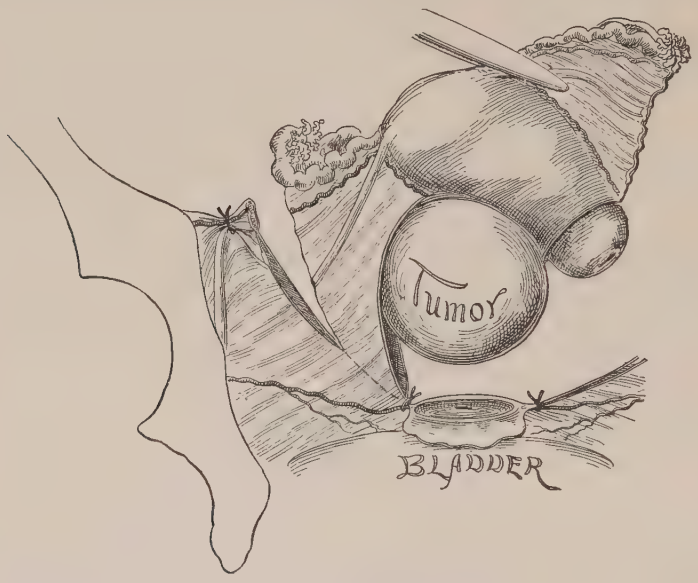


FIG. 980.—OPERATION FOR THE REMOVAL OF AN INTRALIGAMENTOUS UTERINE FIBROID ON ONE SIDE—Fourth Step.
Shows the right broad ligament ligated and partly divided.

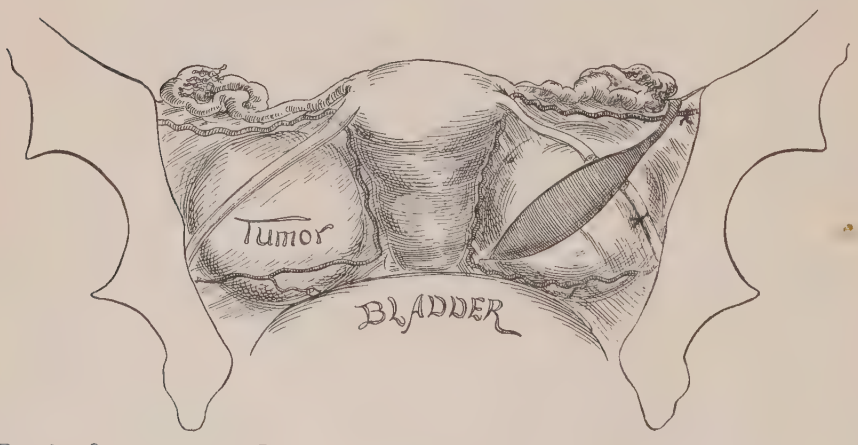


FIG. 981.—OPERATION FOR THE REMOVAL OF AN INTRALIGAMENTOUS UTERINE FIBROID ON BOTH SIDES—First Step.

vaginal junction, the uterus removed, and the clamp on the uterine artery replaced by a ligature (Fig. 980).

The succeeding steps are the same as those described in the typical operation.

An Intraligamentous Uterine Fibroid on Both Sides.—First Step.—The ovarian vessels and the round ligament are ligated separately

on one side and the broad ligament divided over the intraligamentous tumor on its anterior surface from just beyond the fimbriated extremity of the tube down to the vaginal junction (Fig. 981).

Second Step.—Bleeding vessels on the uterine side of the incision are caught with forceps and the intraligamentous growth enucleated from between the folds of the broad ligament (Fig. 982).

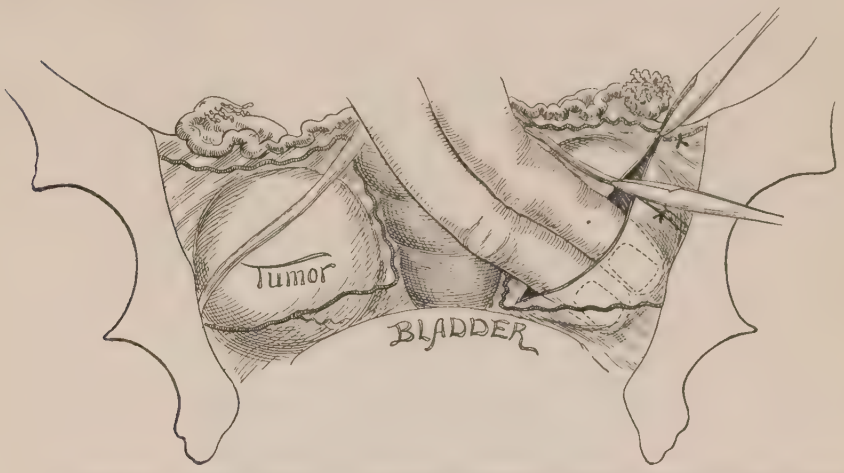


FIG. 982.—OPERATION FOR THE REMOVAL OF AN INTRALIGAMENTOUS UTERINE FIBROID ON BOTH SIDES—Second Step.

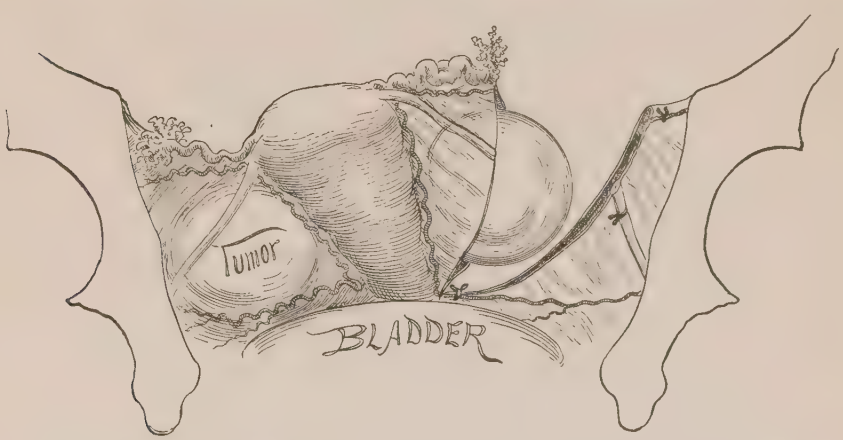


FIG. 983.—OPERATION FOR THE REMOVAL OF AN INTRALIGAMENTOUS UTERINE FIBROID ON BOTH SIDES—Third Step.

Third Step.—The posterior layer of the broad ligament is divided down to the vaginal junction and the uterine artery ligated in the usual manner (Fig. 983).

Succeeding Steps.—The bladder is separated from the uterus, the cervix amputated, and the opposite side dealt with in the same manner as described in cases of an intraligamentous growth occupying only one side of the broad ligament.

COMPLETE ABDOMINAL HYSTERECTOMY.

Definition.—This operation is performed by the abdominal route and consists in the removal or extirpation of the entire uterus.

Synonym.—Panhysterectomy.

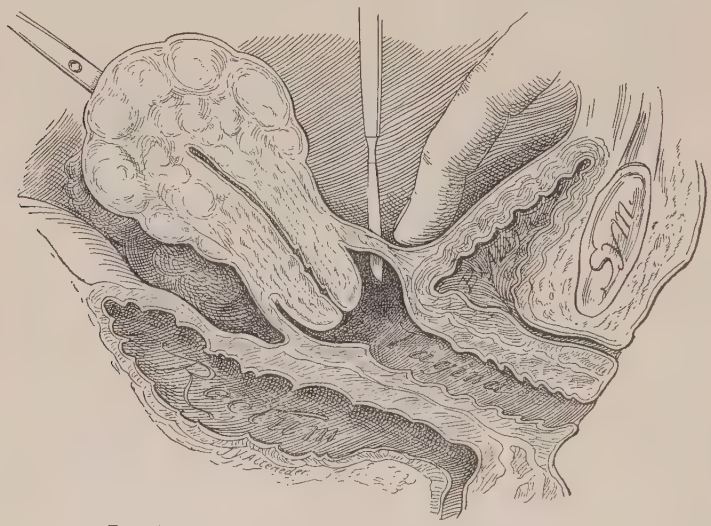


FIG. 984.—COMPLETE ABDOMINAL HYSTERECTOMY—First Step.

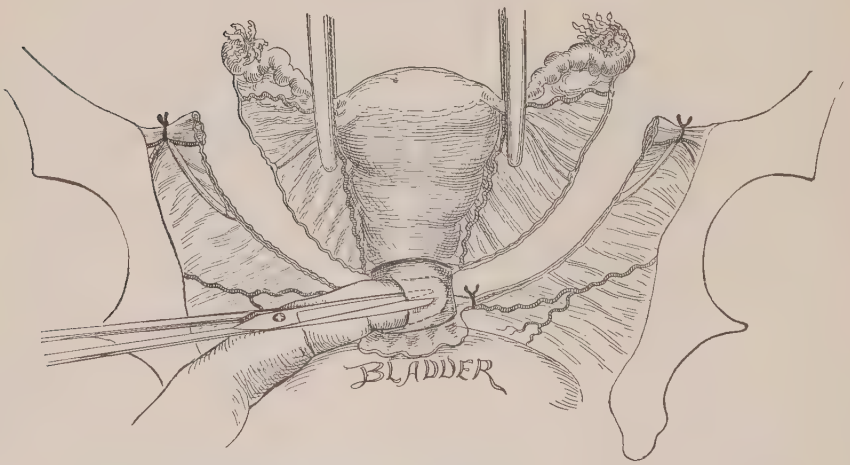


FIG. 985.—COMPLETE ABDOMINAL HYSTERECTOMY—Second Step.

The **Position of the Patient,** the **Number of Assistants,** and the **Instruments** are the same as described in the operation of incomplete hysterectomy.

Operation.—The application of the forceps to the sides of the uterus, the ligation of the ovarian vessels and the round ligaments, the division of the broad ligaments obliquely downward close to the vaginal junction, and the

ligation of the uterine arteries, as well as the separation of the bladder from the uterus, are accomplished in the same manner as described in the typical operation of Incomplete Abdominal Hysterectomy.

The succeeding steps of the operation are carried out as follows:

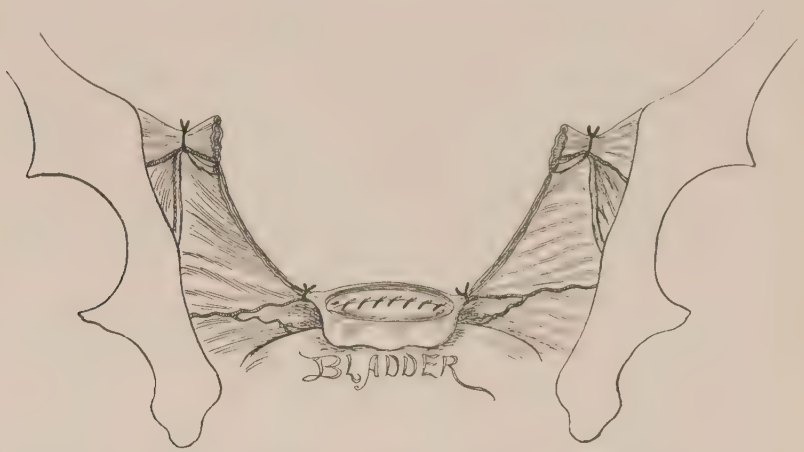


FIG. 986.—COMPLETE ABDOMINAL HYSTERECTOMY—**Third Step.**

First Step.—Traction upward is made upon the uterus and the vaginal junction put upon the stretch. The bladder is then drawn forward with the tip of the index-finger and the anterior vaginal culdesac opened with a scalpel (Fig. 984).

Second Step.—The index-finger is introduced through the opening into the

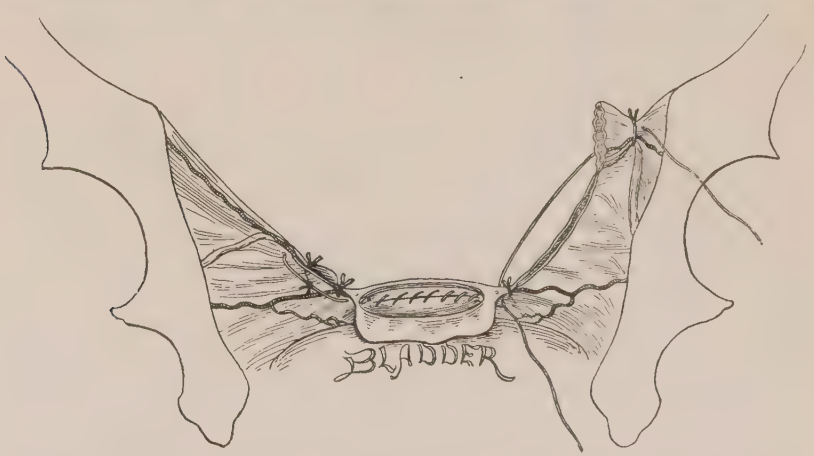


FIG. 987.—COMPLETE ABDOMINAL HYSTERECTOMY—**Fourth Step** (page 998).
On the right side the ligature is tied and the two stumps united; on the left is shown the method of passing the ligature.

vagina and the incision carried completely around the cervix with scissors, separating it from its vaginal attachments (Fig. 985).

Third Step.—The bleeding vessels in the edges of the incision are ligated with catgut and the opening in the vaginal vault closed with catgut sutures which pass to, but do not penetrate, the mucous membrane of the vagina (Fig. 986).

Fourth Step.—An additional ligature is passed under the uterine artery, carried through the broad ligament above the upper pedicle, and securely tied. The procedure is repeated on the opposite side. The union of the two pedicle stumps on each side of the pelvis puts the broad ligaments upon the stretch and supports the vault of the vagina (Fig. 987).

Fifth Step.—The field of operation is covered with the anterior peritoneal flap and the united stumps on each side are turned under the peritoneum and permanently buried beneath it by a continuous catgut suture (Fig. 988).

Variations in Technic.—In cases of malignant involvement of the uterus the ligatures controlling the uterine arteries should be placed as far as possible from the cervix in order to get well beyond the area of disease and lessen the danger of recurrence. The likelihood of injuring the ureters is greatly increased in operations for the complete removal of the uterus, and Kelly recommends the introduction of solid bougies as a preliminary step in order to enable the operator to recognize their situation when the uterine arteries are ligated and the cervix cut away from its lateral attachments.

In some cases the uterine arteries are not ligated until after the vagina has been opened and the structures divided in front of and behind the cervix. The

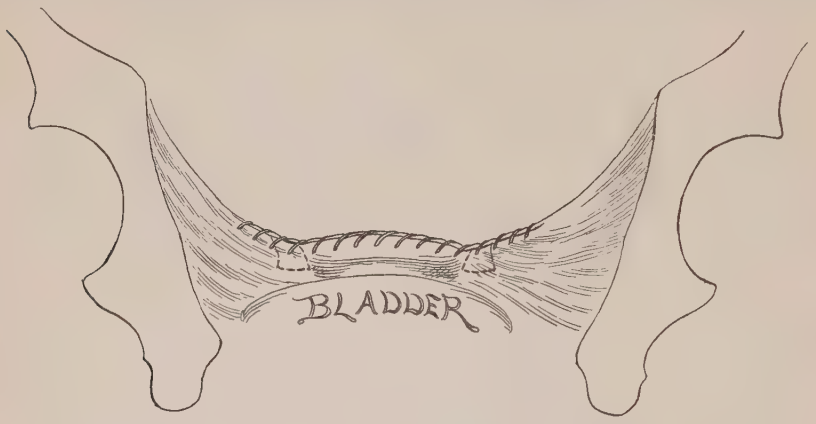


Fig. 988.—Complete Abdominal Hysterectomy—**Fifth Step.**
Note that all the raw surfaces are covered with peritoneum and the stumps of the pedicles buried.

two strips of tissue on each side of the cervix are then ligated *en masse* with silk ligatures and the uterus removed by dividing the structures beyond them.

The question of drainage depends upon the completeness of hemostasis, and if the field of operation is perfectly dry, the vagina should be closed as already described. If, however, the oozing cannot be checked, drainage should be employed through the abdominal incision by means of a glass tube and a strip of gauze which is packed in the pelvis and its free end brought out of the wound. Some operators, on the other hand, prefer to drain through the vagina with a strip of gauze which is passed through the opening in the vaginal vault, and then packed over and around the field of operation. The vulva is then protected with a gauze compress which is secured with a T-bandage and changed as often as necessary. The gauze packing is removed from the vagina and pelvic cavity at the end of the third day, and a fresh strip reintroduced every day or two until the vaginal wound closes. Each time the dressings are applied the vagina should be carefully irrigated with a saturated solution of boric acid and dried with a gauze sponge.

When a complete hysterectomy is performed for malignant disease, the operation should be immediately preceded by the removal of the cancerous tissue in the cervix and the closure of the cervical canal with a continuous silk suture. Before the canal is closed, however, the diseased area should be thoroughly cauterized with the thermocautery in order to char the parts and prevent the transplantation of cancer-cells into healthy structures during the operation. When the disease is well advanced and the cervix is extensively involved, the danger of the transplantation of cancer-cells is greatly increased, and under these circumstances as much as possible of the cancerous tissue should be removed with a sharp curet and the diseased area thoroughly charred with the thermocautery.

VAGINAL HYSTERECTOMY WITH CLAMPS.

Definition.—This operation is performed by the vaginal route, and

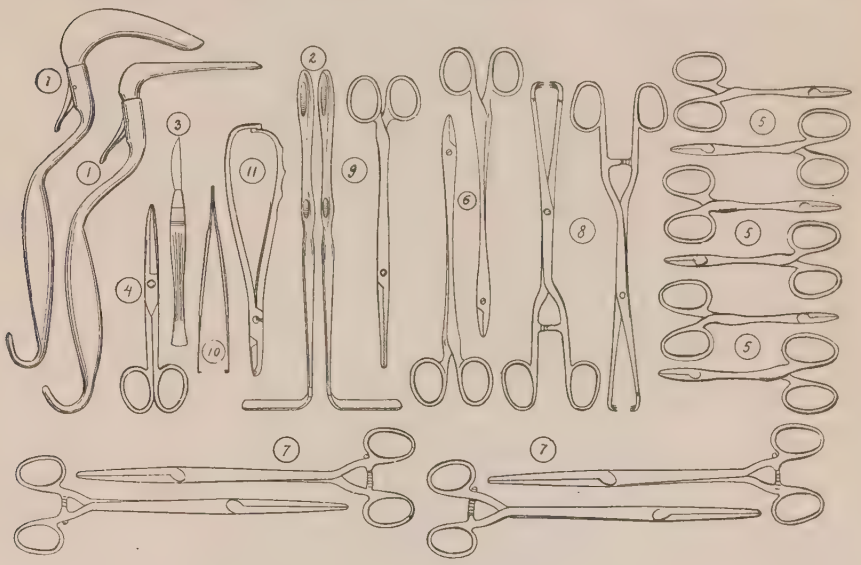


Fig. 989.—Instruments Used in the Operation of Vaginal Hysterectomy with Clamps.

consists in the removal of the entire uterus by means of clamps, which control the uterine and ovarian vessels on both sides of the pelvis.

Position.—The patient is placed in the dorsal position with her feet held by Edebohls's leg-holders and stirrups.

Number of Assistants.—An anesthetizer, two assistants, and a general nurse.

Instruments.—(1) Simon's speculums (curved and flat blades); (2) two lateral vaginal retractors; (3) scalpel; (4) blunt-pointed scissors; (5) six short hemostatic forceps; (6) two long hemostatic forceps; (7) four hysterectomy clamps; (8) two heavy hysterectomy traction forceps; (9) dressing forceps; (10) rat-tooth tissue forceps; (11) needle-

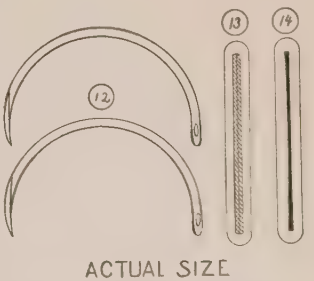


Fig. 990.—Needles and Suture Materials Used in the Operation of Vaginal Hysterectomy with Clamps.

holder; (12) two small full-curved Hagedorn needles; (13) braided silk—No. 12; (14) plain cumol catgut—No. 2, six envelopes.

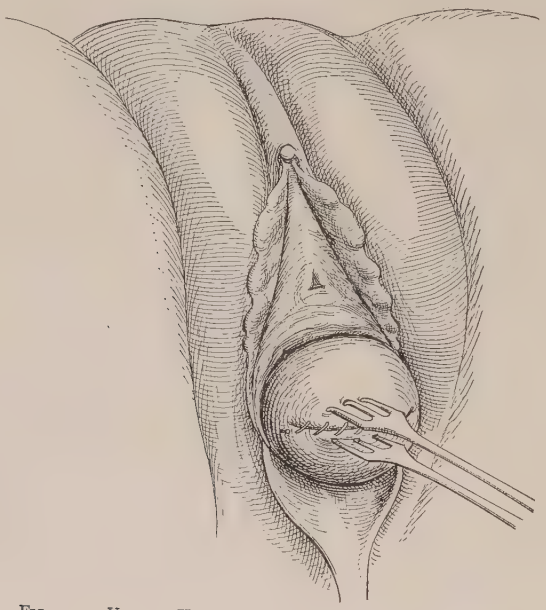


FIG. 991.—VAGINAL HYSTERECTOMY WITH CLAMPS—First Step.

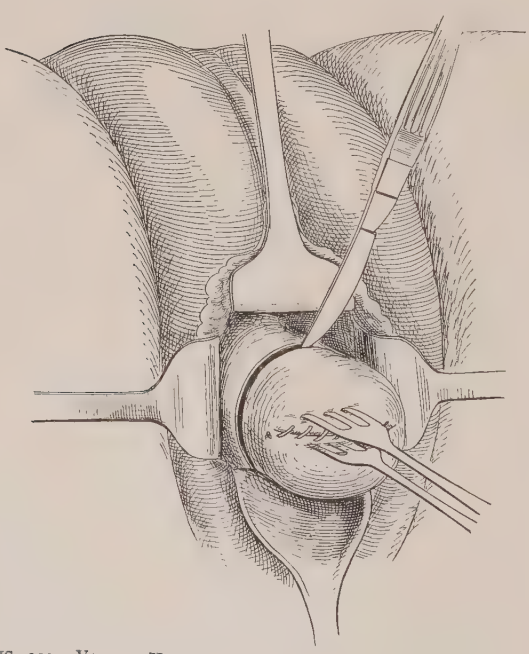


FIG. 992.—VAGINAL HYSTERECTOMY WITH CLAMPS—Fourth Step.

Operation.—**First Step.**—The cervix is exposed with Simon's speculum and all cancerous tissue cureted or cut away. The uterine cavity is then plugged with a narrow strip of gauze, the cureted area charred with the thermocautery, and the cervical canal closed with a continuous suture of silk (No. 12, braided) (Fig. 991).

Second Step.—The speculum is withdrawn and the vagina sterilized in the same manner as described on page 831.

Third Step.—Simon's speculums are introduced and the cervix seized with heavy hysterectomy forceps and dragged downward toward the vulva.

Fourth Step.—The lateral retractors are introduced into the vagina and a circular incision made around the cervix in a line with the cervicovaginal junction (Fig. 992).

Fifth Step.—The vagina and loose cellular tissue around the cervix are

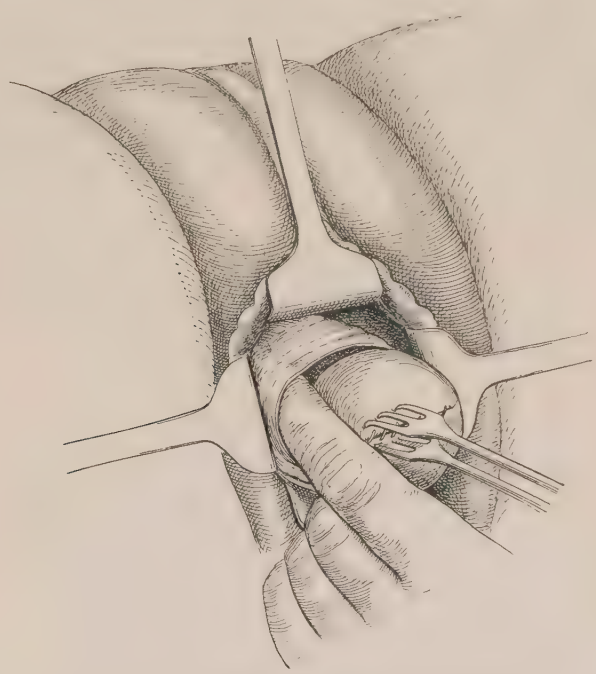


FIG. 993.—VAGINAL HYSTERECTOMY WITH CLAMPS—Fifth Step.

stripped back with the handle of the scalpel or the fingers, or if necessary they are dissected off by means of scissors and tissue forceps (Fig. 993).

Bleeding vessels are ligated with catgut.

Sixth Step.—A small incision is made in the culdesac of Douglas and the opening enlarged on either side as far as the base of the broad ligaments by tearing the tissues with the index-fingers. A digital examination is then made of the pelvic cavity, and if adhesions are found to be present, they are broken up before the clamps are applied to the broad ligaments. A gauze pad with a heavy silk ligature attached is finally placed in the culdesac of Douglas to protect the intestines and absorb the blood (Figs. 994 and 995).

Seventh Step.—The cervix is drawn backward toward the perineum and the bladder separated from the uterus by pushing back the tissues with the

finger or dissecting them off with scissors and tissue forceps. An incision is then made through the uterovesical fold of peritoneum and enlarged laterally up to the broad ligaments with the index-fingers (Fig. 996).

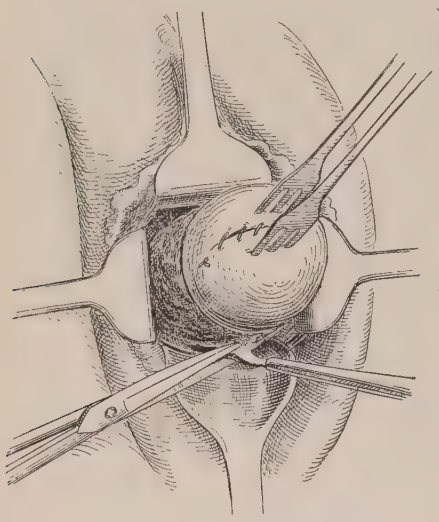


FIG. 994.—Sixth Step.

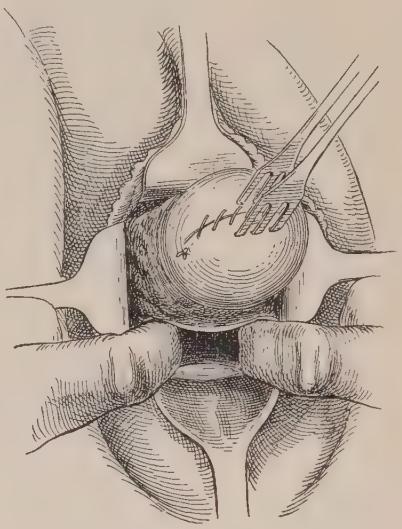


FIG. 995.—Sixth Step.

VAGINAL HYSTERECTOMY WITH CLAMPS (page 1001).

Fig. 994 shows the opening being made into the culdesac of Douglas; Fig. 995 shows the opening being enlarged with the index-fingers.

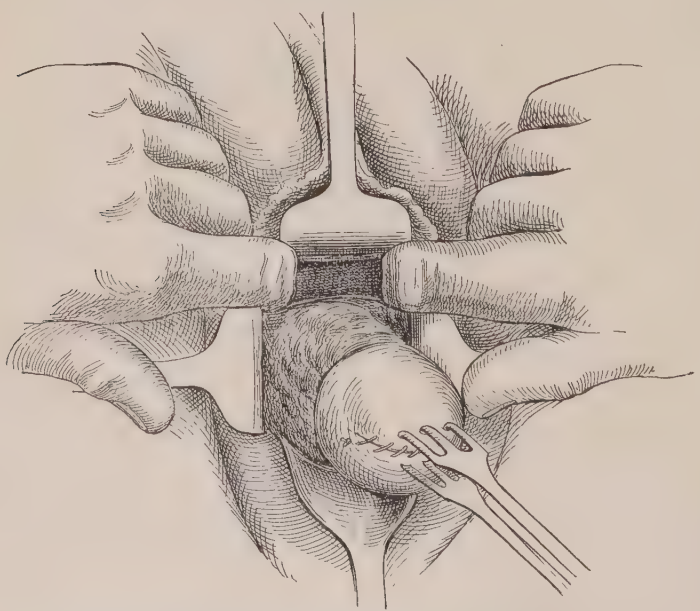


FIG. 996.—VAGINAL HYSTERECTOMY WITH CLAMPS—Seventh Step (page 1001).
Shows the anterior incision into the pelvic cavity being enlarged.

Eighth Step —The tissues are pushed away from each side of the cervix with the fingers toward the pelvic walls in order to free the base of the broad ligaments and displace the ureters laterally. The index and middle fingers are

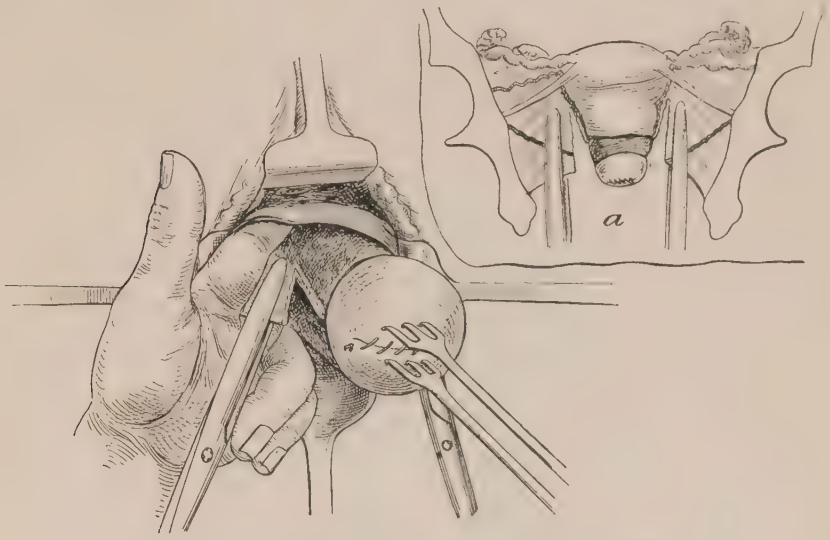


FIG. 997.—VAGINAL HYSTERECTOMY WITH CLAMPS—**Eighth Step.**
Illustration *a* shows both lower clamps applied.

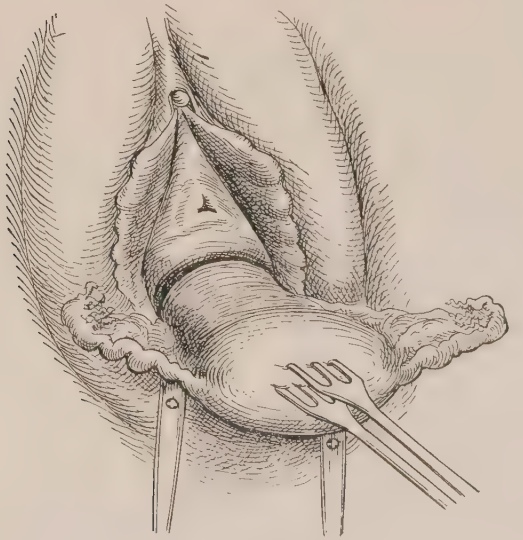


FIG. 998.—VAGINAL HYSTERECTOMY WITH CLAMPS—**Ninth Step** (page 1004).

then placed astride the ligament, and after crowding the tissues laterally it is seized with a hysterectomy clamp between the uterus and the fingers so as to control the uterine artery. The procedure is now repeated on the opposite side and the broad ligaments divided close to each forceps as far as their tips.

Ninth Step.—The speculums and retractors are removed and the cervix released from the grasp of the traction forceps. The index and middle fingers of the left hand are then introduced into the culdesac of Douglas and the fundus

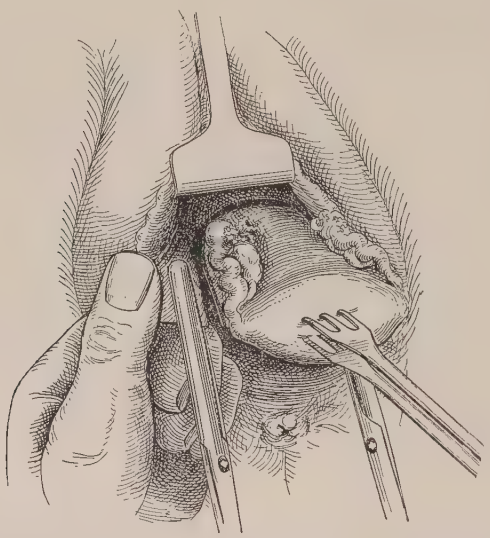


FIG. 999.—VAGINAL HYSTERECTOMY WITH CLAMPS—**Tenth Step.**

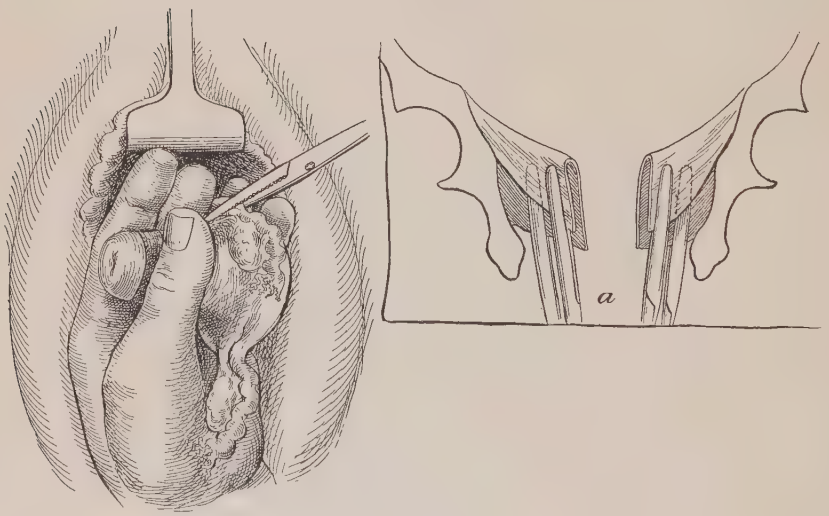


FIG. 1000.—VAGINAL HYSTERECTOMY WITH CLAMPS—**Tenth Step.**
Showing the upper portion of the left broad ligament being clamped. Illustration *a* shows the four forceps in position.

of the uterus pushed forward under the bladder into the vagina, where it is seized with traction forceps and pulled toward the vulva. The tubes and ovaries are likewise brought out into the vagina, and if necessary secured by forceps (Fig. 998).

Tenth Step.—The anterior vaginal wall and the bladder are supported with Simon's flat-bladed speculum and the broad ligament seized beyond the uterine adnexa between the thumb and index-finger. A hysterectomy clamp is then placed on the ligament from above downward as far as the tip of the clamp controlling the uterine artery. The ligament is now divided beyond the clamp and the uterus delivered. The opposite broad ligament is then clamped and divided in the same manner (Figs. 999 and 1000).

Eleventh Step.—The speculums and lateral retractors are reintroduced and the gauze pad removed from the culdesac of Douglas. A large gauze pad is then passed into the pelvic cavity and the intestines pushed up out of the way. The operator now carefully inspects the pedicles and makes sure that the vessels are securely clamped. A heavy silk thread is then tightly wound around the handles of each pair of forceps and securely tied in order to guard against the possibility of the locks slipping (Fig. 1001).

Twelfth Step.—The gauze pad is removed from the pelvis and a strip of gauze packed in the culdesac of Douglas up to the level of the tips of the forceps controlling the uterine arteries. A small gauze pad is then placed between the forceps and the vaginal wall on each side to prevent pressure and the vagina loosely packed with a strip of gauze which is secured by a vulvar compress and a T-bandage.

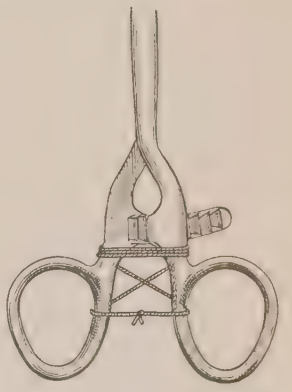


FIG. 1001.—VAGINAL HYSTERECTOMY WITH CLAMPS—Eleventh Step. Shows the method of tying the handle of the forceps.

Variations in Technic.—Some operators use a cautery knife to make the circular incision around the cervix and to open the posterior vaginal culdesac in order to char the edges of the wound and prevent bleeding.

Another variation in the technic is to unite the peritoneum to the edges of the vaginal wound by a continuous catgut suture after the culdesac of Douglas has been opened and the bladder separated from the uterus. The approximation of the peritoneum to the edges of the vaginal incision prevents it from stripping and controls the oozing which usually occurs.

In some cases it may be easier to retrovert the uterus and deliver the fundus posteriorly than to antevert the organ and bring it forward under the bladder. If the former method is employed, the index and middle fingers are passed into the pelvic cavity and hooked over the fundus of the uterus, which is then dragged downward and forward through the posterior opening in the vaginal vault. It is then seized with heavy traction forceps and pulled toward the vulva. The succeeding steps of the operation by which the ovarian vessels are clamped and the uterus removed are the same as already described when the fundus is delivered in anteversion.

Hemisection is sometimes employed when the uterus is enlarged to facilitate its delivery and secure the ovarian vessels with clamps. The procedure, however, is absolutely contraindicated in cases of cancer of the uterus on account of the danger of septic infection and the transplantation of cancer-cells into healthy structures.

After-treatment.—The urine is drawn with a catheter every two hours for the first day, and then every four hours until the forceps are removed, when the patient is usually able to empty the bladder spontaneously.

At the end of forty-eight hours the patient is placed on a table in the dorsal position and the forceps removed.

The bowels are opened by a mild laxative on the third day, and in the meantime any accumulation of flatus is relieved by the rectal tube. The use of a purgative enema is contraindicated, as the injection distends the bowel and displaces the contents of the pelvis.

The gauze packings in the vagina and pelvis are not disturbed for seven days. At the end of that period the patient is placed on a table and the dressings carefully withdrawn from the vagina and the field of operation. The vagina is then gently irrigated with boric acid solution and a fresh gauze packing introduced.

The suppuration which occurs after a clamp operation causes a mild septic infection, and the parts should therefore be kept as sweet and clean as possible. Under these circumstances the vagina should be douched with a solution of corrosive sublimate (1 to 2000), followed by sterile water, instead of the boric acid solution after the middle of the second week, and the vulvar compress should be frequently changed.

The patient is allowed to sit up in bed on the tenth day and to lie on a lounge or recline on an easy chair at the end of the second week.

VAGINAL HYSTERECTOMY WITH LIGATURES.

Definition.—The operation is performed by the vaginal route and consists in the removal of the entire uterus by means of ligatures which control the uterine and ovarian vessels on both sides of the pelvis.

The **Position of the Patient** and the **Number of Assistants** are the same as for the clamp operation.

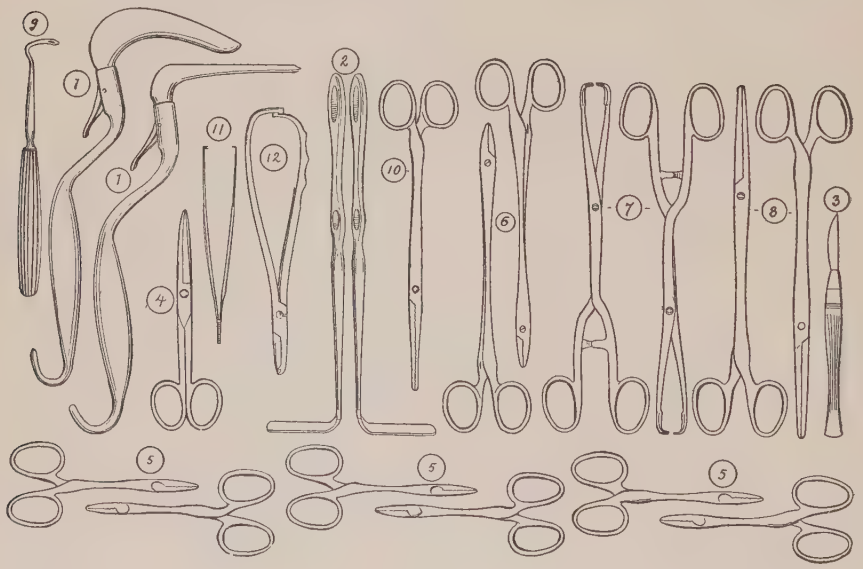


Fig. 1002.—Instruments Used in the Operation of Vaginal Hysterectomy with Ligatures.

Instruments.—(1) Simon's speculums (curved and flat blades); (2) two lateral vaginal retractors; (3) scalpel; (4) blunt-pointed scissors; (5) six short hemostatic forceps; (6) two long hemostatic forceps; (7) two heavy hysterectomy traction forceps; (8) two long-bladed hemostatic forceps; (9) pedicle

needle; (10) dressing forceps; (11) rat-tooth tissue forceps; (12) needle-holder; (13) two small full-curved Hagedorn needles; (14) braided silk—No. 12; (15) plain cumol catgut—No. 2, six envelopes.

Operation.—The **first seven steps** of the operation are the same as described and illustrated in the technic of vaginal hysterectomy with clamps (see p. 1001).

Eighth Step.—The tissues are pushed away from each side of the cervix with the fingers toward the pelvic walls and the broad ligaments grasped between the thumb and index-finger while a ligature of No. 12 braided silk, carried in a pedicle needle, is passed above the uterine artery. The ligature is then tied and the ligated portion of the broad ligament divided close to the uterus. The procedure is now repeated on the opposite side. The free ends of each ligature are left long (Figs. 1004 and 1005).

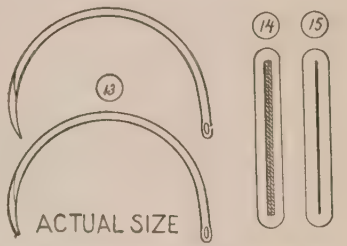


FIG. 1003.—NEEDLES AND SUTURE MATERIALS USED IN THE OPERATION OF VAGINAL HYSTERECTOMY WITH LIGATURES.

Ninth Step.—The speculums and the retractors are removed and the cervix released from the grasp of the traction forceps. The index and middle fingers of the left hand are then introduced into the pelvic cavity and the fundus of the uterus pushed forward under the bladder into the vagina, where it is seized

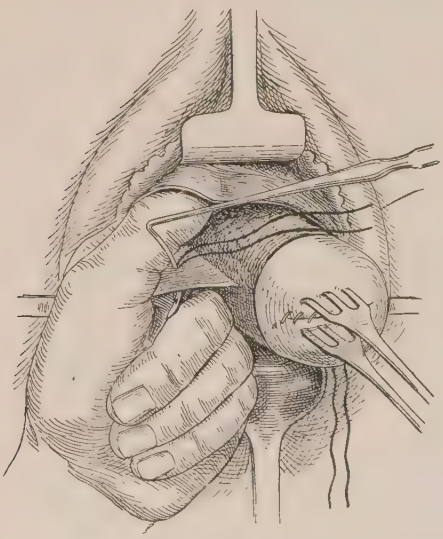


FIG. 1004.—Eighth Step.

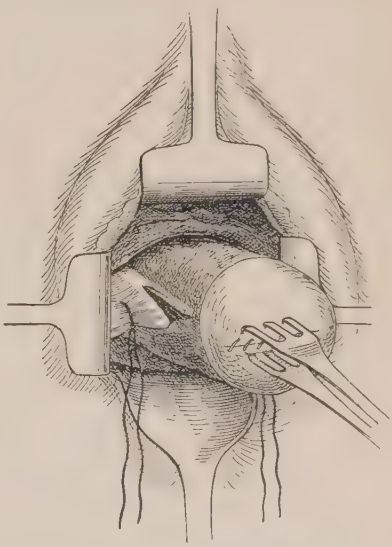


FIG. 1005.—Eighth Step.

VAGINAL HYSTERECTOMY WITH LIGATURES.

Fig. 1004 shows the ligature being applied to the lower part of the right broad ligament; Fig. 1005 shows the ligatures tied and the ligament divided.

with traction forceps and pulled toward the vulva. The tubes and ovaries are likewise delivered, and if necessary secured by forceps (see p. 1004).

Tenth Step.—The anterior vaginal wall and the bladder are supported with Simon's flat-bladed speculum, the unligated portion of the broad ligament is drawn forward with the index-finger, and the uterine appendages are lifted out

of the way. A ligature of No. 12 braided silk carried in a pedicle needle is then passed under the broad ligament and tied. The ligament is now divided

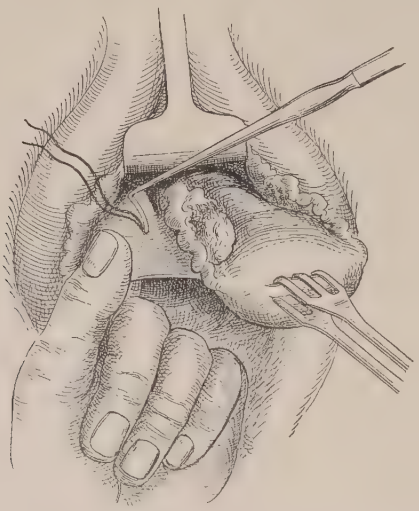


FIG. 1006.—VAGINAL HYSTERECTOMY WITH LIGATURES—**Tenth Step** (page 1007).
Shows the uterus delivered and the upper part of the right broad ligament being ligated.

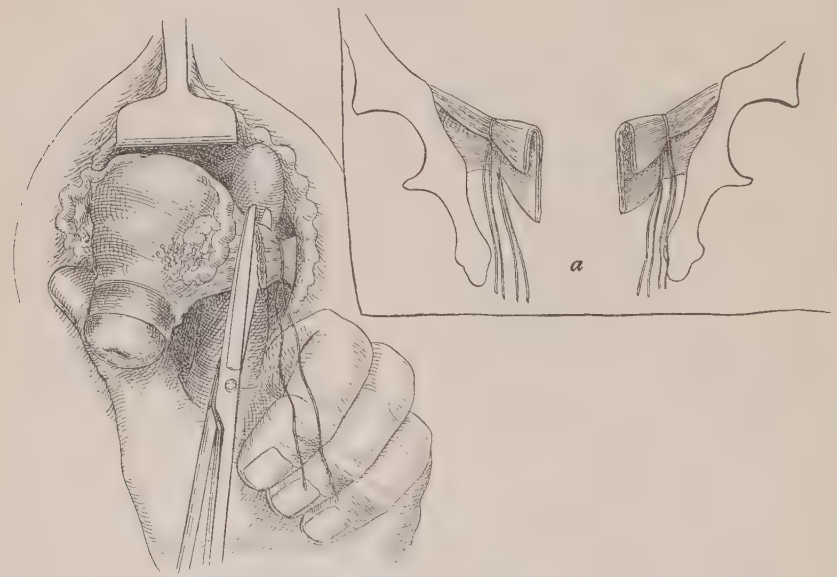


FIG. 1007.—VAGINAL HYSTERECTOMY WITH LIGATURES—**Tenth Step.**
Shows left broad ligament tied and being divided. Illustration *a* shows the four ligatures in position.

close to the uterus and the organ delivered. The opposite broad ligament is then ligated and divided in the same manner. The free ends of each ligature are left long (Figs. 1006 and 1007).

Eleventh Step.—The speculums and retractors are reintroduced into the vagina and the gauze pad removed from the culdesac of Douglas. A large gauze pad is then pushed into the pelvic cavity and the intestines crowded upward. A careful inspection is then made of the field of operation and all bleeding points ligated with catgut.

Twelfth Step.—The gauze pad is withdrawn from the pelvis and the broad ligament stumps drawn by the free ends of the ligatures into the vaginal wound, which is then closed by interrupted catgut sutures. The sutures are passed

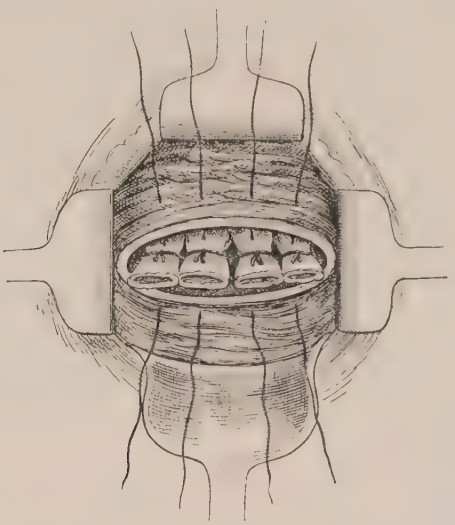


FIG. 1008.—VAGINAL HYSTERECTOMY WITH LIGATURES—Twelfth Step.

so as to transfix each stump, and include the peritoneal and vaginal edges of the wound. The vagina is finally loosely packed with a strip of gauze and the vulva protected with a compress secured by a T-bandage (Fig. 1008).

After-treatment.—The gauze packing is removed at the end of twenty-four hours and not introduced again, and the vagina irrigated with a solution of corrosive sublimate (1 to 2000), followed by sterile water.

The douches should then be given once a day until the wound heals and the patient is discharged.

COMBINED VAGINAL AND ABDOMINAL HYSTERECTOMY.

Definition.—The operation consists in first ligating the uterine arteries and separating the cervix from its attachments through a vaginal incision, and then opening the abdomen and completing the removal of the uterus from above.

Position.—The patient is placed for the vaginal section in the dorsal position with her feet held by Edebohls's leg-holders and stirrups, and then put in the Trendelenburg posture to complete the operation through the abdominal incision.

Number of Assistants.—An anesthetizer, two assistants, and a general nurse are required for the vaginal section. When the abdomen is opened, only one assistant is needed besides the anesthetizer and general nurse.

Instruments.—For the vaginal section either the instruments used in a

vaginal hysterectomy with clamps (see p. 999) or with ligatures (see p. 1006) are required. In completing the operation through the abdominal incision the same instruments are used as for an incomplete abdominal hysterectomy (see p. 984).

Operation.—The vaginal section ends with clamping or ligating the uterine arteries (see vaginal hysterectomy with clamps or with ligatures, pp. 999 and 1006).

The patient is then placed in the Trendelenburg posture, the forceps applied to the sides of the uterus, the ovarian vessels and the round ligaments ligated, and the broad ligaments divided in the same manner as in the operation of Incomplete Abdominal Hysterectomy (see p. 984). And, finally, the vaginal opening is closed and the raw surfaces covered with peritoneum, as in the operation of Complete Abdominal Hysterectomy (see p. 996).

ABDOMINAL MYOMECTOMY.

Definition.—The operation is performed by the abdominal route, and consists in the enucleation of a uterine tumor without sacrificing the uterus.

The **Position of the Patient,** the **Number of Assistants,** and the **Instruments** are the same as described in the operation of Incomplete Abdominal Hysterectomy.

Operation.—After the abdomen is opened the uterus is delivered through the abdominal incision and protected by gauze pads.

If the tumor is pedunculated, a wedge-shaped incision is made into the uterus at the base of its pedicle and the growth removed. The uterine wound is then closed with deep interrupted catgut sutures.

Fig. 1009.

Fig. 1010.

Abdominal Myomectomy.

Fig. 1009 shows a pedunculated subperitoneal uterine fibroid; the dotted line shows the direction of the incision; Fig. 1010 shows the tumor removed and the wound being sutured.

A sessile growth is removed by making a free incision over its surface and shelling it out with the fingers or the handle of the scalpel. In some cases the tumor may be adherent and it will be necessary to use the scalpel or scissors in completing the enucleation. The bed of the tumor is obliterated and the wound closed by deep interrupted catgut sutures.

Temporary hemostasis may be accomplished during the enucleation of the tumor by placing an elastic ligature around the cervix and securing it with

hemostatic forceps, or by the assistant compressing the broad ligaments with his fingers on each side of the uterus.

FIG. 1011. FIG. 1012.

ABDOMINAL MYOMECTOMY.

Fig. 1011 shows a sessile subperitoneal uterine fibroid; Fig. 1012 shows the tumor being enucleated.

After the operation is completed and the sutures introduced into the abdominal incision the patient should be lowered to the horizontal position and the uterine wound examined in order to make sure that there is no bleeding.

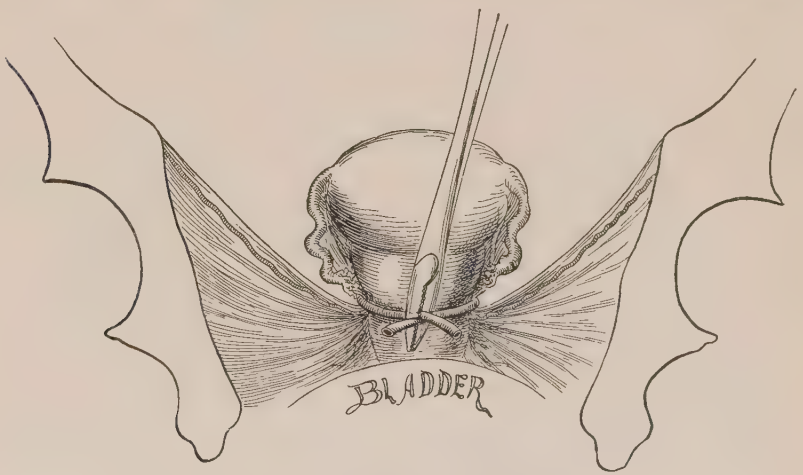


FIG. 1013.—ABDOMINAL MYOMECTOMY.

Shows the method of making temporary hemostasis with a rubber ligature.

If there is no hemorrhage or free oozing from the uterine wound, the abdomen should be closed without employing drainage.

CATHETERIZATION OF THE BLADDER.

The technic of this little operation requires a detailed description, as the catheter is frequently used in an improper manner and infection of the bladder results.

A glass catheter is the best instrument to employ, as it is readily kept clean and can be sterilized by boiling it for five minutes. After using the catheter it

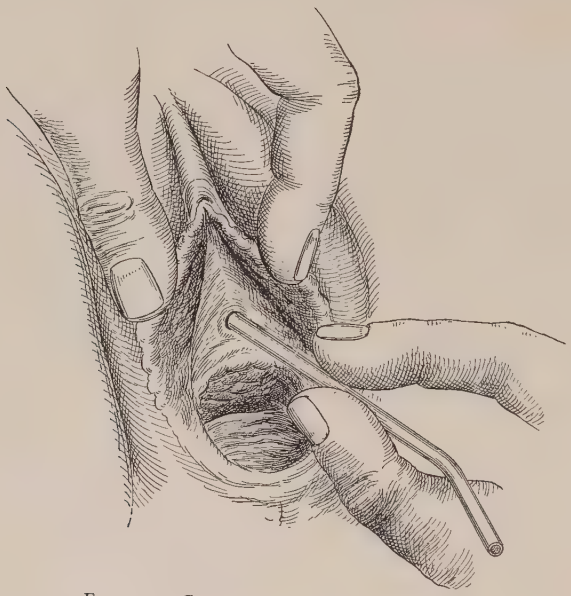


FIG. 1014.—CATHETERIZATION OF THE BLADDER.
Shows the catheter being introduced.

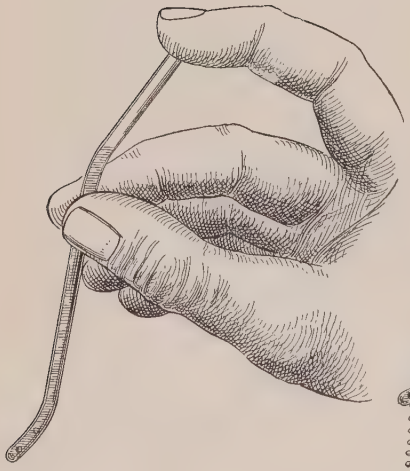


FIG. 1015.

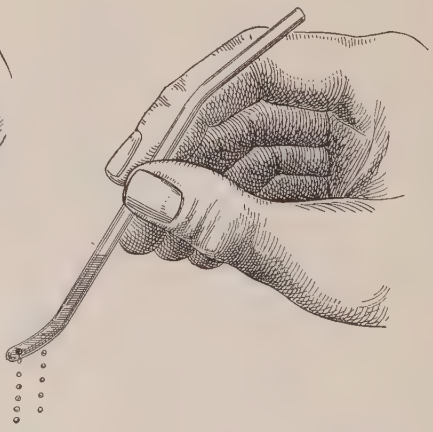


FIG. 1016.

CATHETERIZATION OF THE BLADDER.
Fig. 1015 shows the urine being retained in the catheter by placing the tip of the finger over the opening at the proximal end; Fig. 1016 shows the urine escaping from the catheter.

should be thoroughly cleansed with warm water and soap and boiled for five minutes. It is then wrapped in a sterile towel and put away until needed. If

the catheter is not used again on the same day, it should be placed in the sterilizer and reboiled before introducing it into the bladder.

The antiseptic precautions must be thoroughly carried out in every detail and the nurse must prepare her hands by mechanic sterilization. The patient is placed lengthwise in bed in the dorsal position and a sheet tucked around her knees and thighs so as to expose the vulva to view. The nurse then scrubs the external urinary meatus and adjacent parts with a gauze sponge saturated with tincture of green soap and warm water and douches them with a solution of corrosive sublimate (1 to 2000), which is followed by sterile water or normal salt solution.

The nymphæ are now separated with the thumb and index-finger and the catheter, held in the grasp of the other hand, is passed through the urethra into the bladder. After the urine ceases to flow the catheter is grasped between the thumb and middle finger and slowly withdrawn from the urethra, while at the same time the tip of the index-finger is pressed over the opening at the proximal end. Unless the opening is shut off in this way the urine remaining in the catheter will run out after it is withdrawn and soil the patient's clothing.

CHAPTER XLIV.

APPENDICITIS.

Causes.—The causes of appendicitis may be divided into (1) those that are permanent or constantly present, and (2) those that are temporary or exciting.

Permanent Causes.—Among the permanent factors predisposing to the disease are (*a*) the constant presence of bacteria; (*b*) the anatomic position of the appendix; and (*c*) the retrograde changes taking place in the organ.

The bacillus coli communis is constantly present in the intestinal canal, and consequently in the appendix. Finding its normal habitat there, it retains its non-pathogenic characteristics so long as the structure of the appendix is unaltered. If, however, the lumen of the organ is interfered with by fecal accumulation, or by a stricture, or by a disturbance of the circulation from whatever cause, the bacillus penetrates the walls of the appendix, where it does not naturally belong, and then becomes pathogenic in character. Among the bacteria of etiologic importance in appendicitis are the streptococcus pyogenes, staphylococcus pyogenes aureus, and bacillus pyocyaneus, while among those more rarely found may be mentioned the tubercle bacillus. Probably the most virulent infection results from the streptococcus pyogenes.

Of the constant predisposing causes of appendicitis, the anatomic position of the appendix must be considered an important factor. Its situation in intimate relation with the ileum and head of the colon renders it peculiarly liable to become twisted or kinked whenever these organs are distended with gas or feces. Again, possessing, as it does in most instances, a very short mesentery and receiving its blood-supply through a single vessel, its nutrition is readily disturbed by interference with the circulation, which in turn stimulates bacterial activity.

As it exists in man, the appendix is simply the rudiment of the lengthened cecum found in all mammalia, and as it is no longer of any use, demonstration has shown that it is constantly undergoing retrograde changes. The fact that these changes are taking place predisposes the appendix to inflammatory con-

ditions, as the resisting power and vitality of an unused and retrograding organ are below the normal.

Temporary Causes.—The most frequent exciting causes of appendicitis are to be found in the many acute and chronic conditions affecting the ileum and large bowel. Indiscretions in diet followed by digestive disturbances, fecal or gaseous accumulations at or near the head of the colon, and acute or chronic inflammatory states of the intestinal canal are all liable, at any time, to interfere sufficiently with the naturally low vitality of the appendix to cause pathologic changes in its walls or blood-vessels and thus favor bacterial escape into the tissues.

Foreign bodies and fecal concretions may, by their mechanic pressure or irritation, cause inflammation or ulceration of the appendix. That such are not found at the time of operation nor upon post-mortem examination may be explained, in some instances at least, by the fact that the contractile power of the appendix has caused their expulsion early in the course of the attack, although their presence has been sufficiently prolonged to induce the circulatory changes necessary to inflammation and bacterial activity.

It is generally considered that appendicitis is of greater frequency in men than in women. This statement, however, must be given careful consideration, since it should be borne in mind that peritonitis, from any cause, in the neighborhood of the head of the colon may result in appendicitis by distorting the appendix or by direct extension of the inflammation. As women are so liable to inflammatory diseases of the pelvic organs, it would seem that, in addition to other predisposing causes, to which they are at least as prone as men, they possess in their susceptibility to these diseases a peculiar liability to appendicitis.

The disease may occur at any age, and while it is not infrequently met in the very young, it is most often seen in early adult life. Heavy lifting and occupations involving long-continued standing appear to have some causal relation to the disease. Direct traumatism is also a factor, as attacks occasionally follow an injury or fall.

Among the less frequent of the exciting causes tuberculous and typhoid ulceration may be mentioned, and the possibility that certain of the infections—in particular, influenza—may cause appendicitis should be remembered.

Symptoms.—Although appendicitis may be classified pathologically as being *catarrhal*, *ulcerative*, or *gangrenous*, from the clinical point of view these distinctions are of little value, as the severest forms at first may present the mildest symptoms, so that it is impossible at the bedside to determine the degree of pathologic change taking place.

In acute appendicitis a chill at the onset is rare, the attack being usually ushered in by sudden pain. This in the beginning may be located at any point in the abdomen, or it may be sharply defined or diffuse and colicky in character; within a few hours, however, it usually becomes localized in the right iliac fossa. Pain in this situation, which is its location in most cases from the beginning of the attack, constitutes one of the cardinal symptoms of the affection. Tenderness on pressure soon becomes apparent, and is most marked at the so-called McBurney's point, which is situated at the intersection of a line drawn from the umbilicus to the right anterior superior iliac spine, and a line perpendicular to it and corresponding to the outer edge of the right rectus muscle. At this point palpation frequently reveals a tumor mass or the evidences of a thickened appendix. A symptom of much value is rigidity of the right rectus muscle, a condition best determined by a comparison with the state of the same muscle upon the left side.

The temperature of appendicitis is not characteristic, but fever (100° to 103° F.) associated with pain, tenderness, and rigidity in the right iliac fossa usually means inflammation of the appendix. It must be remembered, however, that the presence of fever is not invariable, and often the most virulent cases present a normal or subnormal temperature. Nevertheless fever is a symptom of great value in the early stage of appendicitis, and in those instances in which it is absent other symptoms generally are present which indicate not only the nature of the malady but also the gravity of the case. The pulse acceleration is usually in proportion to the temperature elevation, but a rapid pulse associated with a normal or subnormal temperature is not infrequently encountered; this increased frequency is an important evidence of the existing infection.

At the onset vomiting is frequent; it ceases within twenty-four to thirty-six hours and rarely becomes stercoraceous. It commonly returns if perforation occurs and upon the development of general peritonitis. The tongue is coated and moist, though later in severe cases it becomes dry. The bowels are usually constipated, though at the onset diarrhea may be present. The urine is scanty, high-colored, and often contains a trace of albumin; occasionally vesical irritation is present at the beginning of the attack, and its presence, together with the distribution of the pain, results at times in cases being mistaken for nephritic colic.

Examination of the blood is of undoubted value in determining the presence of pus. In simple catarrhal inflammation it is only of negative value, the leukocyte count remaining, as a rule, normal; occasionally, however, there is a slight increase in their number. In appendicular abscess, gangrene of the appendix, and general peritonitis a high leukocyte count (20,000 to 25,000) is often present. It is to be borne in mind that the blood-examination must not be relied upon too strongly, but is to be considered in connection with other clinical manifestations. Overwhelming infections and abscesses with non-absorption of toxins do not show leukocytosis. Prolonged cases of appendicitis with septic absorption show a decided secondary anemia.

Simple catarrhal appendicitis if left to itself usually runs a course of from a week to ten days; although slight fever and some tenderness may persist longer. It might be well to emphasize at this point the uselessness of pathologic classifications in actual clinical work; simple catarrhal appendicitis undoubtedly tends to recovery, while suppurating forms and gangrene of the appendix present a high mortality. Unfortunately the symptoms often bear so little relation to the gravity of the lesion that cases are not infrequently met in which the mild symptoms are found at operation to be associated with a gangrenous appendix upon the point of rupturing. It must also be remembered that fever may be absent in cases of the most virulent infection and when the appendix is gangrenous.

Physical Signs.—The results of *inspection* early in the course of the disease are negative, although later some distention may be noticed, particularly in the right iliac fossa. In many instances the attitude of the patient is peculiar, in that she lies upon her back with the right leg flexed in an endeavor to relax the abdominal muscles. *Palpation* reveals marked rigidity of the right rectus muscle, and in some cases the presence of an indurated mass in the appendicular region which yields somewhat to continued pressure. This swelling may be ill-defined, but more commonly is well circumscribed and easily detected. Pain and tenderness are elicited on pressure at McBurney's point. *Percussion* yields dullness unless a portion of the intestine overlies the indurated area, in which case a tympanitic note results.

Appendicular Abscess.—An abscess formation about the appendix is usually preceded by the ordinary symptoms of appendicitis for about four or five days; then all the symptoms become aggravated, and there can be readily detected in the right iliac fossa a tumor, which gradually increases in size and is exceedingly tender to the touch; percussion over this mass gives a dull note. Fever is usually, but not invariably, present, and the pulse frequency is increased, even though there be no elevation of temperature. Examination of the blood may show a high leukocyte count, but if the abscess is surrounded by a well-defined non-absorptive wall, the number of leukocytes will be unaltered. A well-marked chill with sweating is rare. When an abscess forms gradually, the general peritoneal cavity becomes protected by the formation of a strong barrier of adhesions; but in cases in which this does not happen the peritoneum becomes invaded before delimiting adhesions can be formed. Such cases are fulminant and present intensified symptoms from the onset.

General Peritonitis.—Inflammation of the peritoneum results from fulminant infections, a ruptured abscess, or perforation of the appendix by gangrene; evidences of peritonitis may be present from the beginning, but, as a rule, the invasion occurs late. The onset is sudden with diffuse pain; the pulse is rapid; there is moderate fever, which later may disappear, and the temperature become normal or subnormal; the tongue is dry; the urine is scanty; the abdominal muscles are rigid and hard, and should the condition occur early in the disease, the nausea and vomiting of the onset may persist. Within forty-eight hours or more the symptoms become greatly aggravated, with distention of the abdomen, diffuse abdominal tenderness, and abdominal respiratory immobility; the patient lies upon her back with the legs drawn up and the expression of the face is anxious. Signs of collapse soon supervene and the pulse becomes rapid and running in character; the features become pinched and the skin pallid, cold, and clammy.

Relapsing Appendicitis.—A form of appendicitis in which a second attack occurs before the symptoms of the primary attack entirely disappear. These subsequent attacks present no difference in the general character of their symptoms, except that the local manifestations are likely to be more marked, and such interval as there is, is usually attended by some local discomfort.

Recurrent Appendicitis.—With complete recovery from the primary attack at varying intervals, from several weeks to a year or more, the patient suffers from repeated attacks; and, should the intervals be short, her condition becomes one of chronic invalidism. The recurrences may be mild or severe in character, and present no variations from the symptomatology of the primary attack.

Diagnosis.—In typical cases the diagnosis of appendicitis is rarely attended with difficulty. It is based upon the sudden onset of severe pain and tenderness localized in the region of the right iliac fossa; abdominal rigidity more decided in the same neighborhood; and fever usually associated with nausea, vomiting, and constipation. These symptoms occurring in an individual enjoying previous good health admit of but one conclusion as to their cause. Many instances of departure from the typical will be observed, however, and abnormal positions of the appendix by adhesions or other causes may produce some diagnostic confusion. Thus, pain may be referred to a region remote from the right iliac fossa, and, when the appendix is adherent in the pelvis, it is not uncommonly complained of in the left iliac fossa. These cases call for a vaginal and rectal examination by which the inflamed appendix and the surrounding induration can often be detected. Subsidence of pain and disappearance of fever are frequently concurrent with the

development of gangrene, and no false security should be entertained by this apparently favorable occurrence.

In mild cases which are seen at the onset of the attack it may be impossible at times to differentiate between a beginning appendicitis and intestinal colic, and under these circumstances it will be necessary to delay expressing an opinion until the bowels have been flushed with a saline purge. If the pain and general symptoms continue after the intestinal canal has been emptied, we are justified in looking upon the case as one of appendicitis and treating it accordingly.

Differential Diagnosis.—Typhoid Fever.—The greater severity of the pain, its localized character attended with induration and rigidity, the absence of a peculiar eruption, the lack of a characteristic temperature curve and nervous symptoms, constipation rather than diarrhea with peculiar and characteristic stools, and the absence of Widal's and the diazo-reactions, together with the lack of any notable splenic enlargement, are the principal negative features serving to distinguish appendicitis from typhoid fever. Of positive importance is the leukocyte count, which in appendicitis is normal or increased, while in typhoid fever it is diminished, unless perforation should occur, when it shows a progressive rise. Appendicitis, also, is frequently attended with nausea and vomiting while typhoid fever rarely develops these symptoms.

Intestinal Obstruction.—The pain is not apt to be localized in the right iliac fossa; constipation is absolute, peristalsis being so completely arrested that even flatus fails to be expelled; fever, at least early, is absent and the vomiting may becomes stercoraceous in character.

Impaction of the Cecum.—Constipation is positive, the pain is dull in character, and the tenderness is not so localized as in appendicitis. Furthermore, a physical examination reveals a large mass of the contour of the bowel and of doughy consistence, which upon percussion yields a dull note and upon the administration of a brisk purge disappears.

Intussusception.—A condition most frequently encountered in young children; of sudden onset and attended by tenesmus and the expulsion of bloody mucus.

Cancer of the Cecum.—In this condition the tumor is hard and irregular in outline; there are evident loss of weight and strength associated with the development of cachexia, and the history of a chronic ailment.

Renal Colic.—The pain is in the lumbar region and is reflected along the groin and inner side of the thigh of the affected side. There is an absence of localized tenderness and induration, and although the pain and tenderness of appendicitis may have the distribution occurring in renal colic, the bloody urine following the latter is absent. Finally, the passage of a calculus will at once clear up the diagnosis.

A Tumor or Abscess of the Kidney and Suppuration about the Kidney.—The situation of these pathologic conditions is different from that of the induration attending appendicitis; it is higher, being at or near the normal site of the kidney, and the pain and tenderness are not likely to be observed at the same point as in appendicular inflammation. Examination of the urine usually reveals the presence of blood, pus, or an excess of urates or phosphates, and is of service in demonstrating the seat of the trouble to be in the kidney.

Acute Infective Cholecystitis.—This condition cannot at all times be distinguished from appendicitis. In typical cases the onset is sudden with paroxysms of pain in the region of the gall-bladder passing through to the back in the neighborhood of the right shoulder-blade; this is frequently attended by nausea, vomiting, some febrile disturbance and acceleration of the pulse-rate, and marked prostration. Rigidity and localized tenderness occur in the region

of the gall-bladder, and at times the tumor resulting from its distention can be detected. Unfortunately the pain is not infrequently referred to the region of the appendix, and under such circumstances an error in diagnosis is likely to result. Symptoms of value as indicating inflammation of the gall-bladder rather than appendicitis are a recent attack of typhoid fever or pneumonia, the history of a former cholecystitis or of cholelithiasis, in many cases jaundice, and in some instances the evidences of an enlarged gall-bladder.

Gall-stone Colic.—The pain associated with this condition is agonizing in character and usually requires the use of morphin for its relief; it is referred to the right hypochondrium and is reflected to the epigastrium and to the region of the right shoulder-blade posteriorly. Jaundice is a common attendant of these attacks and an examination of the stools may result in the discovery of a gall-stone. Constipation occurs and the feces show a diminution in, or an absence of, bile; the urine is dark in color and shows the presence of biliary pigments. If the gall-bladder contains a number of stones a gall-stone crepitus may be elicited. Although these cases are frequently attended by a febrile movement and nausea and vomiting, they can usually be differentiated from appendicitis by the absence of pain, tenderness, rigidity, and induration in the right iliac fossa.

Acute Pancreatitis.—In this affection the pain, which is sudden in onset and colicky in character, is in the upper abdominal zone and is associated with nausea and vomiting followed by collapse. Within twenty-four hours the local tenderness in the epigastrium is usually succeeded by a circumscribed swelling, which may be either dull or tympanitic upon percussion; the abdomen is swollen and tense and the bowels are constipated. At first the temperature is normal or subnormal, although later there is fever. Young, healthy adults are most frequently affected, and the condition not uncommonly follows attacks of indigestion. The situation of the pain and tenderness and the location of the swelling, as well as the rapidly supervening collapse, are the chief points in the differential diagnosis.

Hemorrhage into the Pancreas.—It is sudden in its onset and also occurs in individuals apparently in perfect health. In addition to epigastric pain, nausea, vomiting, and collapse, there is extreme restlessness. The temperature remains normal or subnormal.

Ectopic Pregnancy.—Rupture of a Fallopian tube resulting from an ectopic pregnancy is characterized from the onset by severe pain in the lower part of the abdomen, followed by symptoms of hemorrhage, viz., shock, rapid pulse, normal or subnormal temperature, nausea, and vomiting. Vaginal examination reveals an enlarged uterus with enlargement and tenderness of the involved tube as well as tenderness behind and at the side of the uterus. The abdomen is tender, distended, and tympanitic. Women in whom this accident occurs usually give a history indicative of a previous salpingitis, or have not borne children for several years. Irregularity of the menstrual function usually precedes the rupture.

Salpingitis.—Inflammatory conditions of the tubes are usually secondary to uterine inflammation, particularly gonorrheal or puerperal infections. Pain in the lower part of the abdomen associated with abdominal tenderness may characterize this condition, as well as backache and derangement of the menstrual function. During the exacerbations of pain the leukorrheal discharge, if present, is apt to increase. Vaginal examination reveals the enlarged and tender tube.

Inflammation of the Ovaries.—The attendant pain is commonly worse before the menstrual period, the occurrence of which usually affords relief. This symptom is more apt to be reflected to the region of the bladder and rectum

than to be definitely localized, as it is in appendicitis; it is also aggravated by walking. Vaginal examination shows the ovary to be extremely tender to the touch.

Dietl's Crises.—These are associated with movable kidney, and as they are characterized by intense pain, local swelling, and induration in the neighborhood of the right iliac fossa, errors in diagnosis may occur. With the cessation of the pain, however, there is usually a disappearance of the swelling, and a careful examination will reveal the kidney in its displaced position.

Acute Peritonitis of Tuberculous Origin.—The presence of fever, abdominal pain, and tenderness constitute the symptoms likely to give rise to the diagnosis of appendicitis. The absence of signs referred to the appendicular region, however, and the more gradual development of tuberculous peritonitis, and the concurrent development of tuberculous processes in the lungs, serve to establish a correct diagnosis.

Perforating Gastric Ulcer.—In this condition the onset is abrupt, and the pain, which is intense, in addition to being referred to the epigastrium, is very frequently reflected to the right iliac fossa. Such of these cases as present no antecedent history of gastric disease are almost always mistaken for appendicitis. The history, therefore, of such pre-existing symptoms as would point to gastric ulcer becomes an important factor in establishing a correct diagnosis.

Treatment.—The treatment of a primary attack of appendicitis, existing alone or in connection with a tubo-ovarian lesion, should be operative, and so soon as the diagnosis is made the appendix should be removed. It is not within the power of a surgeon to determine the pathologic conditions present at the seat of disease nor to know how the attack will terminate, and delay simply means playing a game of chance with the odds in favor of death. My personal experience in the treatment of appendicitis compels me to acknowledge a profound ignorance as to the prognosis of a mild attack, and I cannot be far wide of the mark in stating that this ignorance is equally shared by the profession at large. Can the physician or surgeon at the bedside of a patient tell whether bacteria have penetrated the tissues of the appendix? And, if they have, can he say whether or not they will pass through its walls and infect the peritoneal cavity? Is it possible to base the prognosis of a mild catarrhal appendicitis upon the presence or absence of an appendicular stricture? Have we any signs that point to the presence of a foreign body within the appendix as the cause of the inflammation, or is it possible to know, when pus is forming, whether or not it will become circumscribed or escape into the general peritoneal cavity? Surely no surgeon would have the temerity to answer these questions in the affirmative; and yet unless we are able to determine these conditions, how can we allow a case of appendicitis to be treated medically and give the patient a false hope of security at a time when dangers we know not of may intervene and cause a fatal ending?

The question of operation in cases of recurrent attacks of appendicitis is not a difficult one to decide, as a secondary outbreak of inflammation means that the original cause is still present and likely at any time to jeopardize the life of the patient. Again, as in the case of a primary attack, we have no means of knowing what the course of the inflammatory process will be, nor can we determine the pathologic conditions present at the seat of disease, and therefore an appendectomy should be performed so soon as the diagnosis is made.

In cases of recurrent appendicitis appendectomy should never be postponed in order to operate during the interval between attacks. If, however, the patient

is seen for the first time during one of the intervals, advantage should be taken of the quiescent state of the inflammatory process and the appendix removed.

Technic of Appendectomy.—The Preparation of the Patient and the Preparations for the Operation are described on pages 834 and 837.

Position of the Patient.—The patient is placed in the Trendelenburg position at an angle of about 20 degrees.

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

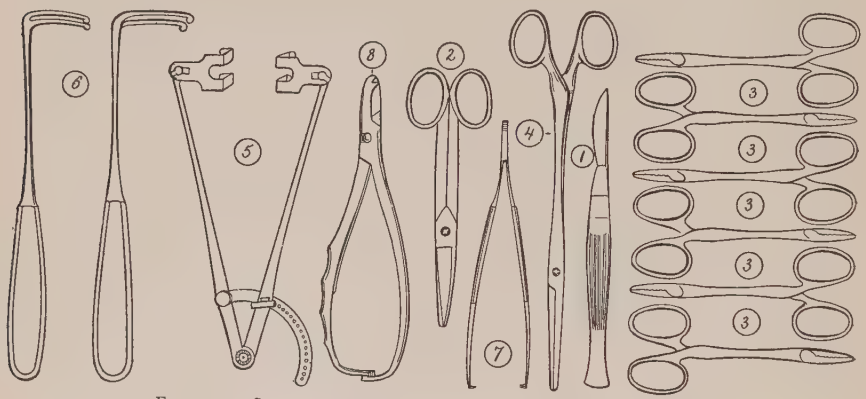


FIG. 1017.—INSTRUMENTS USED IN THE OPERATION OF APPENDECTOMY.

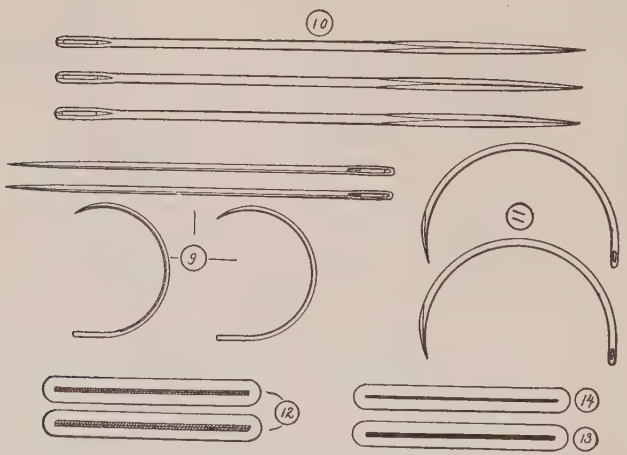


FIG. 1018.—NEEDLES AND SUTURE MATERIALS USED IN THE OPERATION OF APPENDECTOMY.

Instruments.—(1) Scalpel; (2) scissors; (3) six short hemostatic forceps; (4) dressing forceps; (5) Ashton's self-retaining abdominal retractors; (6) abdominal retractors; (7) tissue forceps; (8) needle-holder; (9) two straight and two curved round-pointed intestinal needles; (10) three straight triangular-pointed needles; (11) two small full-curved Hagedorn needles; (12) braided silk—Nos. 2 and 7; (13) silkworm-gut—20 strands; (14) plain cumol catgut—No. 2, four envelopes.

Operation.—First Step.—The abdomen is opened by an incision (from 1½ to 2 inches or more in length) which begins about one inch above the anterior iliac spine and passes obliquely downward through McBurney's point in the direction of the fibers of the external oblique muscle (Fig. 1019).

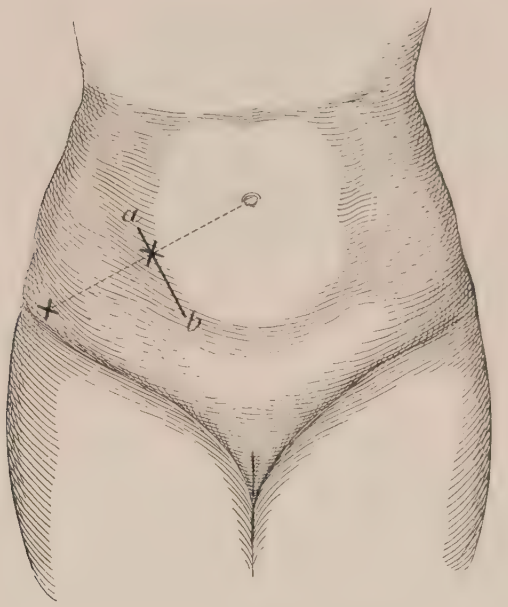


Fig. 1019.—Appendectomy—**First Step.**
The line from *a* to *b* shows the situation of the incision over McBurney's point.

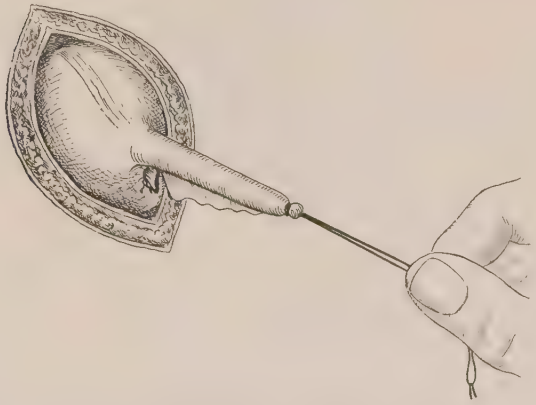


Fig. 1020.—Appendectomy—**First Step** (page 1021).
Shows the head of the colon within the abdominal wound and the mesoappendix ligated and severed. The control ligature is tied around the tip of the appendix and held taut by the assistant.

The appendix is then located by the following method, which was originally suggested by J. Chalmers DaCosta ("Medical News," June 9, 1894): Insert the index and middle fingers into the wound and follow the parietal peritoneum

from the external margin of the incision in an outward, backward, and inward direction until they meet with an obstruction. The first obstruction encountered is the head of the colon, and after locating this point the appendix can usually be quickly found and scooped into the wound.

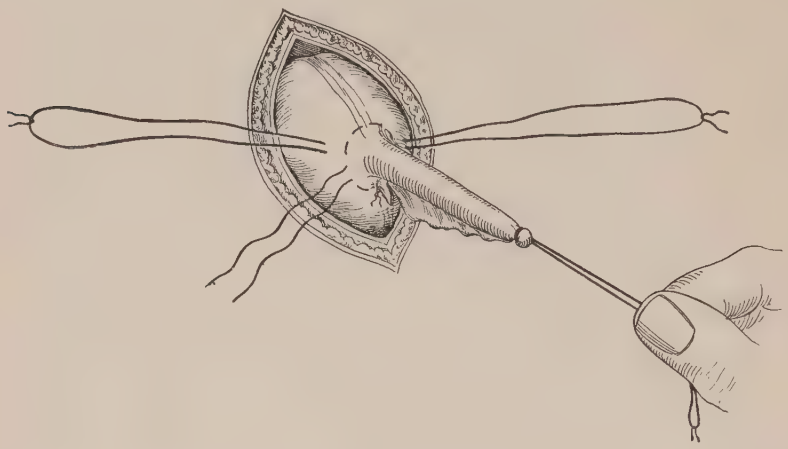


FIG. 1021.—APPENDECTOMY—**Second Step.**
Shows the purse-string suture and the control ligatures in position beyond the base of the appendix.

A No. 7 braided silk ligature is now tied around the tip of the appendix, the free ends knotted, and the loop, which should be about six inches long, is held taut by the assistant. The mesoappendix is then ligated and severed (Fig. 1020).

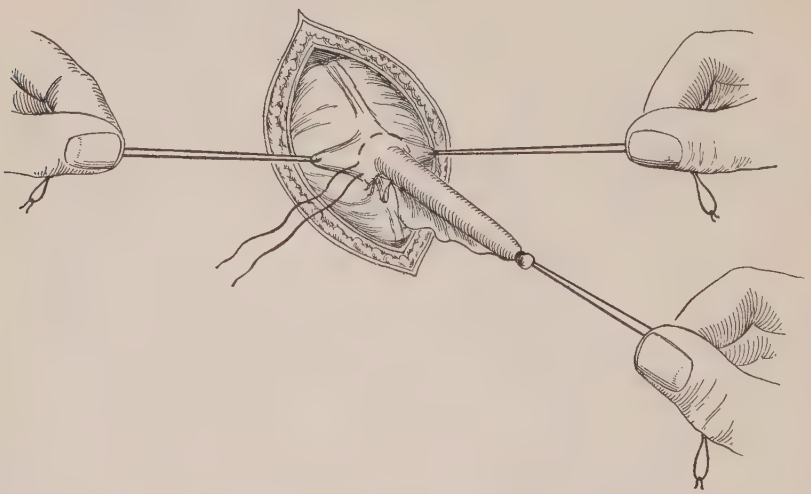


FIG. 1022.—APPENDECTOMY—**Third Step.**
Shows the control ligatures held taut, and the head of the colon within the abdominal wound.

SECOND STEP.—A ligature—No. 2 braided silk—is now passed through all the coats of the colon, except the mucous, about three-fourths of an inch beyond each side of the base of the appendix. The free ends of the ligatures

are then tied, leaving two loops, each six inches long, which are used to control the head of the bowel. A purse-string suture is now passed through all the coats of the bowel, except the mucous, about half an inch from the base of the appendix (Fig. 1021).

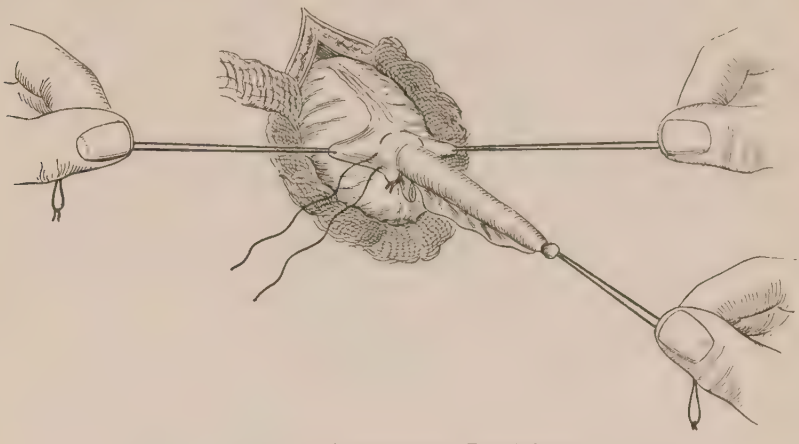


FIG. 1023.—APPENDECTOMY—**Fourth Step.**
Shows the gauze packing being placed around the head of the colon.

THIRD STEP.—The appendix and head of the colon are now completely under the control of the operator, who keeps the appendix taut by traction upon the ligature which is tied around its tip. At the same time the assistant grasps

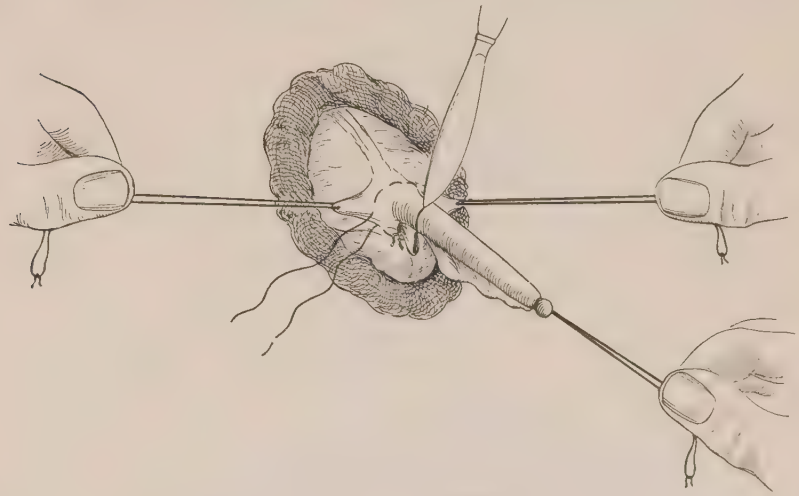


FIG. 1024.—APPENDECTOMY—**Fifth Step** (page 1024).
Shows the gauze packing completed and the circular incision being made through the serous coat of the appendix.

the loop on each side of the base of the appendix, and by making traction upon them holds the colon well within the abdominal incision (Fig. 1022).

FOURTH STEP.—The seat of operation is now shut off from the surrounding parts by packing a strip of plain gauze around the head of the colon (Fig. 1023).

Fifth Step.—A circular incision is made through the serous coat of the appendix about half an inch above its base (Fig. 1024).

Sixth Step.—The peritoneum is then stripped back beyond the base of the appendix with the scalpel (Fig. 1025).

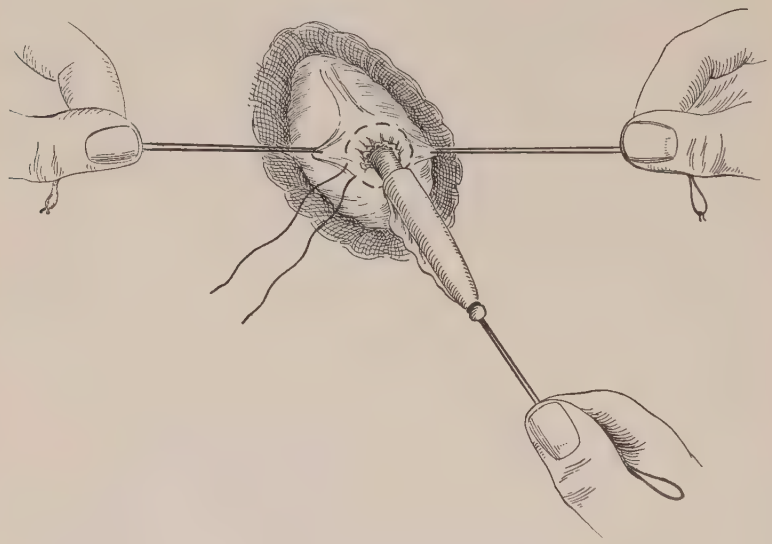


Fig. 1025.—Appendectomy—**Sixth Step.**
Shows the serous coat stripped back beyond the base of the appendix.

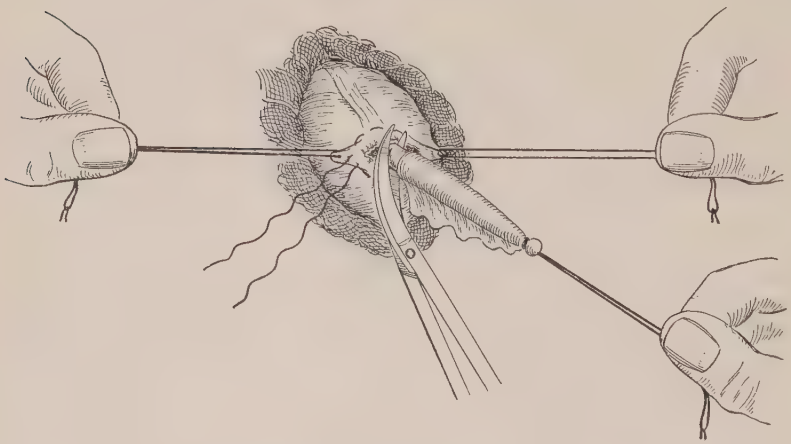


Fig. 1026.—Appendectomy—**Seventh Step.**
Shows the appendix being amputated beyond its base.

Seventh Step.—The appendix is amputated below its base with scissors (Fig. 1026).

Eighth Step.—The opening in the bowel is now closed by inverting its edges with forceps as the purse-string suture is tied and subsequently introducing two mattress sutures to guard against leakage (Figs. 1027 and 1028).

NINTH STEP.—The surgeon douches the seat of operation with warm normal salt solution and dries the parts with a gauze sponge. The gauze packing around the head of the colon is then removed; the control ligatures cut and withdrawn from the bowel; and the colon allowed to sink back into the abdominal cavity. The abdominal incision is finally closed and dressed in the usual manner.

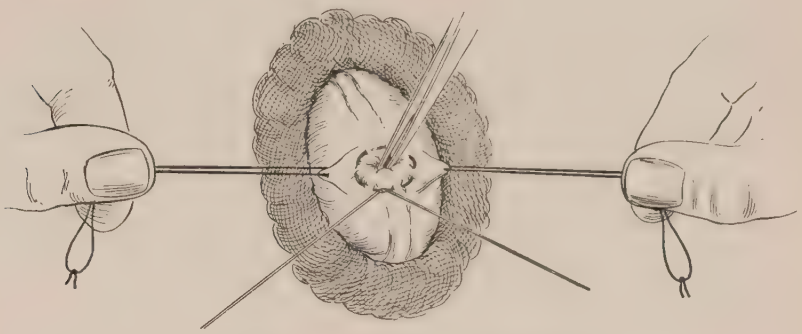


FIG. 1027.—APPENDECTOMY—**Eighth Step.**
Shows the purse-string suture being drawn taut while the edges of the wound are inverted with forceps.

Special Directions.—The control ligatures which pass through the walls of the colon on either side of the base of the appendix should penetrate only the submucous or fibrous coat, because if they enter the lumen of the gut, infection may result from capillary attraction.

From the time the appendix is amputated until the opening in the colon is sutured and the field of operation douched and dried, the assistant must keep

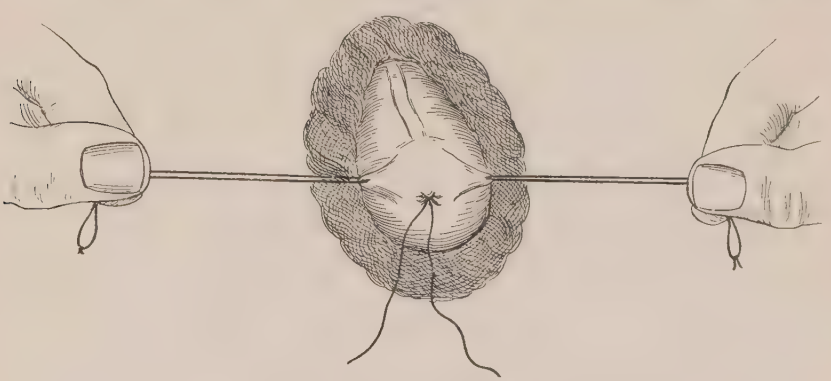


FIG. 1028.—APPENDECTOMY—**Eighth Step.**
Shows the cecal wound closed by the purse-string suture. The two mattress sutures which reinforce the approximation of the wound are not shown.

the control ligatures taut to prevent the bowel from becoming displaced and infecting the surrounding intestines.

The serous coat of the appendix must be stripped off well below its base so that when it is amputated a portion of the wall of the colon is also removed. This not only thoroughly eradicates all the diseased structures, but it also leaves no redundant tissue to interfere with the close approximation of the edges of the wound. As a matter of fact, under these circumstances, the serous coat

usually retracts and partially closes the opening before the purse-string suture is drawn taut. The antiseptic precautions employed during the operation must be thoroughly carried out, as we are necessarily dealing with an open wound of the intestine. Therefore all instruments which come in contact with the seat of operation must be thrown aside at once, and not used again. Thus the knife which is employed to make the circular incision through the serous coat, and the scissors used to amputate the appendix, naturally become infected, and must be discarded at once. A serious mistake is often made from an antiseptic standpoint in operations of this character by using the same sponge several times on the seat of operation. This technic undoubtedly spreads infection, and often causes post-operative complications which can easily be avoided. A sponge which has been pressed once against the tissues should be discarded and not used again. If this is not done, the pathogenic germs which adhere to the sponge will be scattered over the uninfected areas surrounding the field of operation. In an aseptic field this precaution is, of course, unnecessary, but when, as in an appendectomy, the sponge comes in contact with the contents of the intestinal canal, it is obviously a dangerous practice, and one which must result in jeopardy to the life of the patient.

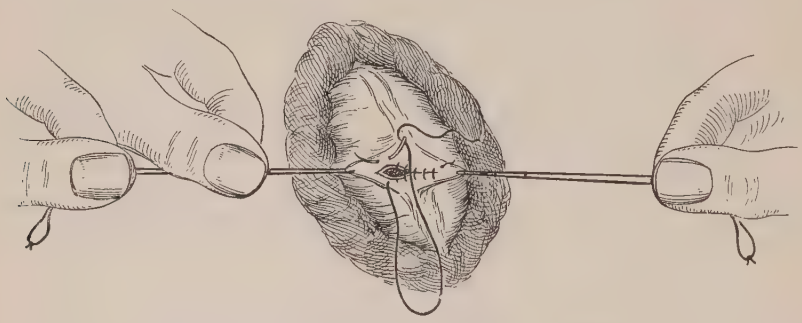


FIG. 1029.—APPENDECTOMY. **Variation in the Technic.**
Shows Cushing's suture being introduced. The assistant is making traction on the head of the colon while the surgeon steadies the field of operation with the upper control ligature.

Variation in the Technic.—If for any reason a purse-string suture cannot be used to close the opening in the colon, a Lembert or a Cushing suture may be substituted (Fig. 1029). The first six steps of the operation are the same as described above, and after amputating the appendix, the surgeon grasps the upper control ligature about an inch from the bowel with the fingers of his left hand to steady the field of operation while the wound is being closed. The sutures are introduced with a small, full-curved intestinal needle, which must be held in the grasp of a needle-holder or a hemostatic forceps.

Remarks.—In performing an appendectomy there is always danger of infecting the parts surrounding the seat of operation when the appendix is amputated and the opening in the gut is sutured. The reason for this is evident, and is due to the operator's fingers and the instruments coming in contact with the exposed intestinal mucous membrane at the seat of amputation.

Many of the unexpected deaths which follow operative interference in uncomplicated cases of appendicitis, as well as the chronic sinuses and the delayed recoveries which result, are undoubtedly due to an infection from this cause. It could hardly be otherwise when we consider the usual methods employed in the technic of the operation, as there is constant danger of touching the septic mucous membrane with the fingers or the instruments when the head of the

colon is held between the thumb and the index-finger of the left hand during the introduction of the sutures to close the opening in the bowel. Again, the head of the colon may slip from the grasp of the operator's fingers during the process of suturing, and before it can be brought into position again, the surrounding intestines may come in contact with the opening in the bowel and become infected.

The practical importance of an operative technic which reduces to a minimum the danger of direct infection during the necessary manipulations of an appendectomy cannot be overestimated, and with this object in view I have devised the operation described above. The method gives the surgeon complete mechanic control of the colon and prevents his fingers or the intestines from becoming infected, as the appendix can be amputated and the opening in the bowel sutured without the operator touching the seat of operation.

Technic in Suppurative Appendicitis.—In all cases in which the surrounding intestines have been contaminated with pus or fecal matter, local washing (see p. 892) or general flushing (see p. 892) with normal salt solution should be employed and the seat of operation drained with glass or rubber tubing and gauze. If only the adjacent coils of intestines are soiled, they should be cleansed by local washing; but if the septic material is scattered throughout the abdominal cavity, general flushing should be employed. The distal end of the drainage-tube should be placed in the most dependent part of the field of operation and gauze packed around it to protect the intestines. The free end of the gauze is brought out of the incision and the abdominal wound closed above and below the exit of the drain. The gauze should be removed on the fourth or fifth day and the glass or rubber tubing allowed to remain a few days longer according to the character and quantity of the discharge.

After opening a circumscribed appendicular abscess its cavity should be gently explored with the index-finger, and if the appendix cannot be readily found a persistent search should not be made for it, as there is imminent danger of rupturing the barrier of lymph and infecting the peritoneum. Under these circumstances the appendix should not be disturbed, and the abscess cavity should be treated by evacuating the pus, irrigating with normal salt solution, and draining with rubber tubing and a strip of gauze; the wound is closed above and below the exit of the drain. The gauze should be removed on the fourth day and the tubing allowed to remain until the sac contracts. After the removal of the gauze the cavity should be flushed once a day with normal salt solution, and at the end of the first week with hydrogen peroxid and a solution of corrosive sublimate (1 to 2000), followed by sterile water.

When the base of the appendix has sloughed off and the colon is adherent and ulcerated, it is often impossible to introduce sutures and close the opening. In these cases the head of the colon should be isolated from the surrounding intestines by gauze packing and the field of operation drained with rubber tubing. In the course of four or five days a wall of lymph is formed and the gauze may be removed. The rubber tube should be allowed to remain until the process of repair is well advanced and contraction of the cavity takes place. In many of these cases a fecal fistula results and the contents of the bowel escape through the abdominal wound and the rubber tubing. The fistulous opening, however, closes in the course of two or three weeks, and the fecal matter passes out by the natural channel.

CHAPTER XLV.

MOVABLE KIDNEY.

Definition.—Movable kidney is a term broadly applied to any kidney which departs from its normal position, and is a condition of extreme importance in its relation to diseases of the female sexual organs. The mobility of the organ in question may be so slight that it is palpated with difficulty, or it may be so freely movable that its abnormal position can be readily detected; again, the departure from its normal position may be so great that the condition receives the designation of *floating* or *wandering kidney*, and it may occupy almost any part of the abdominal cavity, even to the opposite side of the median line.

Causes.—Rapid loss of weight with wasting of the perirenal fat normally surrounding the kidney is in many instances the causal factor of movable kidney, and by some is regarded as the most important. Therefore, the condition is to be found associated with all wasting diseases, whether acute or chronic, and it follows that it is encountered more frequently in those who are thin than in the obese.

The relaxation of the abdominal walls incident to repeated pregnancies has been held accountable for the occurrence of movable kidney, although the condition is quite as frequent in those who have never borne children as in those who have borne many. Tight lacing, by forcing down the contents of the abdomen, is regarded by some as of etiologic importance, while others consider that a tightly fitting corset affords the best means of retaining the kidney in its normal position. Traumatisms, a jarring fall, heavy lifting, and excessive vomiting may cause a movable kidney, especially if predisposition to the condition exists by the previous absorption of the perirenal fat.

Nephroptosis, or movable kidney, may exist in association with *enteroptosis*, or displacement downward of all the abdominal viscera; this fact should not be overlooked in any given case.

Usually but one kidney, the right, is displaced; occasionally both, or only the left. The probable explanation of the relative frequency of mobility on the right side is that the right viscus, from its situation, is subjected to pressure by the liver as it descends with each inspiration. It is of much greater frequency in women than in men, doubtless because of the predisposing factors already mentioned. It is claimed by some that in many cases the condition is induced by congenital relaxation of the peritoneal attachments of the kidney, a hypothesis that may be reasonably applied to floating kidney, as arising from a congenital mesonephron, but appears to bear no relation to a movable kidney. Between these two conditions it is well to make a distinction, the one, movable kidney, being so much more frequent, and usually attended with more decided symptoms than the other, or floating kidney.

A *movable kidney* is one in which the range of mobility is limited to the enlarged area of its fatty capsule. A *floating kidney*, on the other hand, has a normal fatty capsule and its mobility depends upon a mesonephron.

The **body form** is an important etiologic factor of movable kidney, and not only explains the greater frequency in women than in men, but also the reason why the right organ is more often displaced than the left.

In the normal subject there is a fixed relation beween the length and circumference of the body cavity. The body cavity consists of the thorax, abdomen, and false pelvis, and may be divided into *three zones* by two transverse planes passing through the following fixed points: The *first* plane passes through

the thoracic cavity at the lower edge of the sternum proper, and the *second* through the abdomen on a level with the lower border of the tenth rib.

The upper zone of the body cavity is included between the suprasternal notch and the first plane, and contains the thoracic viscera. The middle zone is included between the first and second planes, and contains the stomach, spleen, pancreas, liver, and the major portion of each kidney. The lower zone is included between the second plane and the superior strait of the pelvis and contains the minor portion of each kidney and the intestines (Fig. 1030).

In women the middle zone is liable to be contracted in all directions, and consequently there is a tendency toward displacement downward of all the organs occupying this region. The liver, being compressed from before backward, pushes the superior pole of the right kidney forward and displaces the entire organ downward.

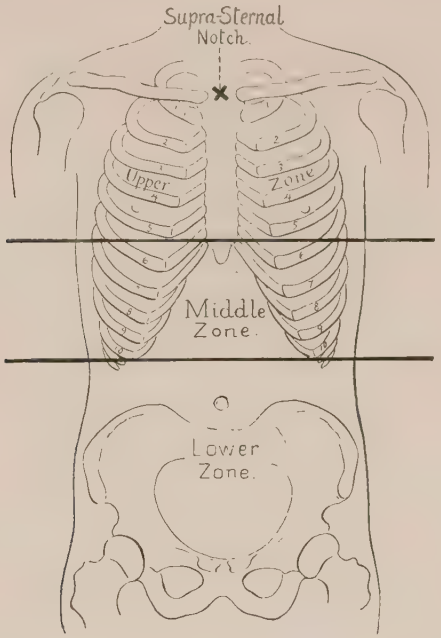


FIG. 1030.—SHOWING THE THREE ZONES OF THE BODY CAVITY (UPPER, MIDDLE, AND LOWER), AND THE POSITIONS OF THE TWO TRANSVERSE PLANES.

From a systematic study of the body form, Becker and Lenhoff were able to predict in a given case whether or not the kidneys would be found displaced; the relation between the length and circumference of the body cavity being expressed in an index the formula of which is denoted thus:

$$\frac{\text{Distance from suprasternal notch to symphysis}}{\text{Circumference of body at lower border of tenth rib}} \times 100 = \text{body index.}$$

These measurements are taken with the patient lying in the horizontal recumbent position at the end of expiration during a normal respiratory act. The circumference of the body at the lower border of the tenth rib is first taken, and then the distance between the suprasternal notch and the symphysis (*jugulo-symphysis measurement*) is ascertained (Fig. 1031). Thus, for example, if the jugulo-symphysis measurement is found to be 20 inches and the circumference

of the body at the lower border of the tenth rib 26 inches, the formula is expressed as follows:

$$\frac{\text{Jugulo-symphysis measurement 20 inches}}{\text{Circumference at tenth rib 26 inches}} \times 100 = 76.9, \text{ which represents the body index.}$$

It has been found from observation that the greater the contraction of the middle zone of the body cavity, the higher will be the body index, and vice versa. Becker and Lenhoff came to the conclusion that when the body index was below 75, the kidneys were never found displaced; and when the index was above 77, the organs were nearly always situated lower than normal.

Symptoms.—A movable kidney may exist without producing any symptoms whatever, and the condition is often discovered accidentally. This is

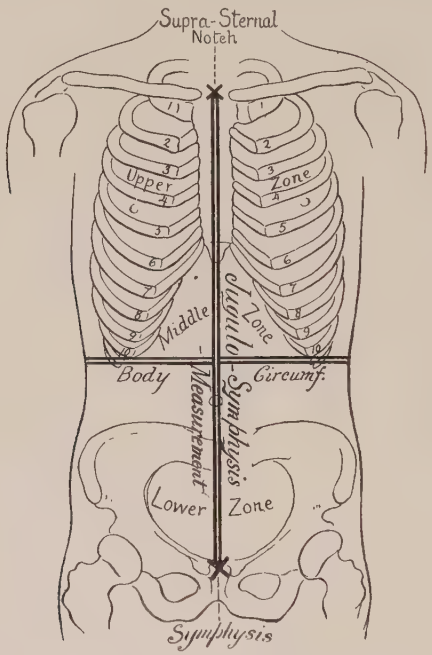


FIG. 1031.—SHOWING THE SITUATIONS OF THE MEASUREMENTS THAT ARE TAKEN TO DETERMINE THE BODY INDEX.

especially true when the mobility is slight, although even when the organ is freely movable there may be no subjective symptoms.

Subjective Symptoms.—The subjective symptoms are considered under the following headings:

Digestive disturbances.
Neurasthenia.
Abdominal symptoms.
Urinary symptoms.
Uterine and pelvic symptoms.
Dietl's crises.

Digestive Disturbances.—Gastro-intestinal disturbances are of frequent, almost constant, occurrence. Loss of appetite and dyspeptic manifestations, often associated with nausea and vomiting, are frequent. Epigastric

pain, occurring independently of the stage of digestion, but little influenced by pressure, and constant in its location to the left of the ensiform cartilage, is a symptom commonly complained of. Eructations of gas, offensive breath, and constipation with flatulence are frequently distressing symptoms. As a result of pressure upon the duodenum dilatation of the stomach may supervene, and also as a pressure-symptom jaundice may be present.

Neurasthenia.—Neurasthenia is a constant and most important manifestation of movable kidney, although there is nothing peculiar in the grouping of the symptoms to indicate their cause. Most patients complain of a tired feeling and an utter lack of desire to exert themselves, and of dull aching pains in the back and thighs. Headache, vertigo, and numbness of the lower extremities are symptoms less frequently met. Increased frequency of the heart-beat is a more or less constant symptom, and cardiac palpitation may be most persistent and annoying.

Abdominal Symptoms.—Abdominal manifestations are almost always present. Not infrequently patients complain of distress when lying upon the side opposite to that of the displacement. Of still more frequent occurrence is a dragging sensation felt in the loins and the abdominal cavity when the patient is in the erect posture and after taking a long walk or active exercise. If the displaced kidney is freely movable, it may be recognized by the patient as a swelling in the abdomen. This is especially true if the kidney is sensitive and pressure not infrequently produces pain of a sickening character.

Urinary Symptoms.—The association of urinary symptoms with movable kidney is rare. These symptoms, when present, are caused by the twisting of the pedicle, producing acute hydronephrosis, which is usually intermittent in character, and at times accompanied by severe and alarming local and constitutional manifestations. Usually these symptoms are mild, the intermittent hydronephrosis being followed by moderate polyuria and frequency of micturition.

Uterine and Pelvic Symptoms.—The uterine and pelvic symptoms dependent upon movable kidney are rare. These may be manifested in the form of dysmenorrhea, menorrhagia, miscarriage, and vesical irritability. During pregnancy and menstruation the symptoms of a movable kidney are aggravated. In the later period of pregnancy, however, the symptoms usually entirely disappear, the enlarged uterus affording adequate support to the kidney and keeping it in its normal position; upon the termination of gestation the symptoms reappear.

Dietl's Crises.—In some cases, usually those characterized by marked mobility, there occur extremely acute attacks consisting of severe abdominal pain followed by nausea, vomiting, chills, fever, and signs of collapse. These attacks were first described by Dietl, and are supposed to be due to the twisting of the kidney upon its pedicle. The urine, as a rule, is greatly diminished in quantity and contains an excess of uric acid.

Objective Symptoms.—The physical signs of movable kidney are, as a rule, easily recognized. The examiner must have an exact knowledge of the normal situation of the kidneys and the manipulative dexterity to properly palpate the abdomen. Mistakes in diagnosis are frequently made and movable kidneys unrecognized because of the examination being roughly and improperly conducted. Abdominal palpation must be made with a light touch or a displaced kidney may slip back into its normal position and its existence be unrecognized.

The physical signs are elicited by the following methods:

Palpation.	Inspection.
Percussion.	Mensuration.

Palpation.—To examine the position of the kidneys the patient should be placed in one of the following positions: (1) The horizontal recumbent position; (2) the Sims's or the lateral-prone position; (3) the erect position; (4) the sitting position.

Horizontal Recumbent Position.—In the recumbent position the patient lies upon her back with the legs drawn up and the thighs flexed. The abdominal muscles are thus relaxed and deep palpation made possible. The surgeon stands at the side of the patient with one hand placed under the lumbar region while the fingers of the other hand palpate the front and side of the abdomen below the costal margin. By using pressure above and counter-pressure below, the mobility of the kidney may be recognized. Although this position is the one most generally used, as it is convenient both to the patient and surgeon, the diagnosis cannot be made with the same degree of certainty as when an examination in the erect position is resorted to. Therefore if a negative result follows an examination in the horizontal recumbent posture, the erect position should be employed.

Sims's Position.—When the examination is made in the lateral-prone or Sims's position the patient is placed upon the side opposite to that of the kidney to be examined. The surgeon stands in front of the patient with one hand over the lumbar region, and with the fingers of the other hand makes counter-pressure anteriorly below the costal margin. The position of the patient causes the kidney, if movable, to fall forward, so that it is easily recognized by the examining fingers.

The Erect Position.—The patient stands about one foot and a half from the side of a table with the body inclined forward and the hands resting upon the top. The lower extremities must be kept at a right angle with the floor upon which the patient stands and the body inclined forward from the hip-joints and not by bending the spine. The surgeon stands back of the patient, the examination being made with one hand by placing the thumb over the lumbar region, the fingers being pressed anteriorly below the costal margin. If two hands are used in making the examination, the surgeon stands at the side of the patient.

The erect position must be correctly taken or the space beween the costal margin and the crest of the ilium is greatly lessened and the results of the examination rendered uncertain. This position is by far the most useful of all in which to examine the situation of the kidneys. It is impossible for a movable kidney to escape detection, as it must fall forward and downward when the patient stands in the manner described. Mistakes are frequently made by relying upon the horizontal recumbent position, for the reason that the kidney may not be forced into an abnormal position during palpation. This, however, cannot occur with the patient in the erect posture, as the kidney must of necessity leave its normal position if movable.

The Sitting Position.—In the sitting position the patient sits upon the edge of a chair with the body bent forward and the hands resting upon the knees. The surgeon sits on a chair at the side of the patient and the examination is made as in the erect position when two hands are used. This posture is a modification of the erect position, but has no advantages over it. On the other hand, the abdomen is not so well relaxed and the space between the costal margin and the ilium is apt to be lessened unless the patient is very careful not to bend the spine.

Percussion.—Percussion over the lumbar region is of no practical value as a physical sign of movable kidney.

Inspection.—This method of investigation is of value only when the

abdominal walls are thin and the kidney freely movable. Under these circumstances the outlines of the kidney may be seen through the abdominal walls when the structures are crowded forward by strong pressure over the lumbar region. A depression in the lumbar region is never seen as the result of a displaced kidney.

Mensuration.—If the body index is above 77, the kidneys are nearly always displaced (see causes, p. 1028).

Diagnosis.—The diagnosis is made by finding a tumor possessing various degrees of mobility and having the contour, size, and consistency of the kidney, with or without the associated symptoms already described.

Although the differential diagnosis, as a rule, does not present many difficulties, the affection must be distinguished at times from the following lesions:

Ovarian Tumors.—Tumors of the ovary are occasionally mistaken for movable kidney, but they may be recognized by their fixed position and by the results of a vaginal examination.

Floating Spleen.—A displaced spleen may rarely be confounded with a movable kidney. The spleen, however, is larger and of different shape, the anterior border is sharp and presents one or more notches. Furthermore, a movable kidney upon the left side is relatively infrequent.

Malignant Tumors.—A malignant neoplasm involving an abdominal viscus is recognized by its more or less fixed position and by not possessing the shape and consistency of the kidney. The constitutional disturbances in malignant disease are characteristic; loss of weight and strength, cachexia, and a secondary anemia with leukocytosis making a clinical picture not met in movable kidney.

Distention of the Gall-bladder.—This lesion may be differentiated from movable kidney by carefully studying its shape and contour, as well as the extent and direction of its mobility; an enlarged gall-bladder also is observed to descend with inspiration.

When the enlargement of the gall-bladder is due to malignant disease, the tumor is firm, irregular in outline, and tender upon pressure; jaundice is common and cachexia develops sooner or later.

Treatment.—The treatment of a movable kidney depends upon the local and constitutional symptoms produced by the lesion, and hence each case must be carefully studied before resorting to radical measures. The degree of dislocation does not always correspond to the severity of the symptoms, and it is not uncommon to meet cases in which there is considerable mobility without general or local manifestations being present. It is important to bear this fact in mind, as these patients require no special form of treatment and their minds should not be allowed to dwell upon the mobility of the kidney. It is often very difficult to decide what is best to do in an individual case, and unless the symptoms can be traced by a process of exclusion directly to the renal lesion, we should not advise radical measures. If, however, this can be done and no other lesions are discovered to account for the symptoms, we are justified in attributing them to the mobility of the kidney and directing the treatment toward its relief.

The treatment of the affection is considered under the following headings:

The palliative treatment.

The operative treatment.

The Palliative Treatment.—An attempt may be made to restore and maintain in its normal position the displaced kidney by means of a properly adjusted abdominal bandage with a pad or compress so placed that it brings pressure to bear directly upon the lower pole of the kidney when replaced in its proper position. The patient should be instructed in the method of replacing the organ and the adjustment of the support before rising in the morning. The

bandage should be made of muslin (see description of an abdominal bandage on p. 850), as an elastic support does not produce sufficient pressure upon the compress and cannot be kept clean. A well-fitting corset rather tightly laced constitutes an excellent device for the support of a displaced kidney; it fulfils one of the strongest indications for its use in movable kidney in that it affords support to all the abdominal viscera; it should be put on before rising and fastened from below upward. Supporting the kidney by means of a bandage or a corset not only affords great comfort to the patient, but also relieves the reflex symptoms and lessens the danger of the occurrence of Dietl's crises.

The rest cure offers the best means at our command to increase the weight and fat of the body, and at the same time relieve the nervous and gastro-intestinal symptoms which usually accompany the affection. The forced feeding, massage, and electricity, as well as the prolonged rest in bed, often modify the results of the lesions, and in some cases bring about a symptomatic cure.

In some instances measures looking to the restoration of the muscle-tone may be indicated, and good results have followed the use of cold sponging, massage, and indoor exercises (see p. 117), together with absolute rest in bed for several hours each afternoon.

Drugs, aside from those tending to improve the appetite and relieve constipation, are useless, although any tendency to an excess of uric acid or calcium

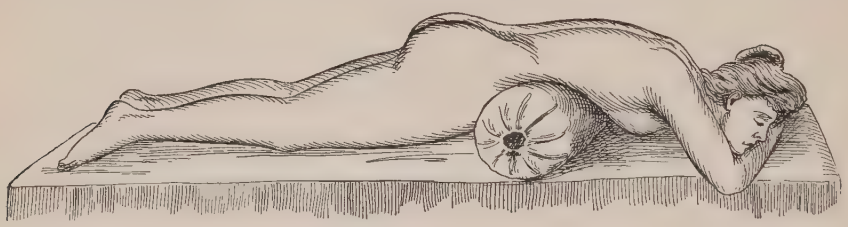


FIG. 1032.—NEPHRORRHAPHY.
Shows the position of the patient and Edebohls's kidney cushion.

oxalates in the urine must be combated by proper dietary regulations and the exhibition of such remedies and measures as will facilitate their elimination.

A movable kidney can never become permanently anchored again by palliative treatment, and no hope of a radical cure should be held out to the patient under the circumstances, as the relief or the modification of the symptoms is all that can be accomplished unless operative measures are resorted to.

The Operative Treatment.—The operation of nephrorrhaphy should be performed in all cases in which a radical cure is indicated. The technic devised by Edebohls is far superior to any other I know of, and I therefore have no hesitancy in recommending it as the operation of selection.

Technic of Nephrorrhaphy.—The *Preparation of the Patient* and the *Preparations for the Operation* are described on pages 834 and 837.

An extra set of dressings must be prepared to place over the opposite lumbar region in order to equalize the pressure when the patient lies upon her back after the operation.

Position of the Patient.—The patient lies prone upon Edebohls's kidney air-cushion which presses against the abdomen and crowds the kidney into the lumbar wound (Fig. 1032).

Number of Assistants.—An anesthetizer, one assistant, and a general nurse.

Instruments.—(1) Scalpel; (2) four short hemostatic forceps; (3) Ashton's kidney traction forceps; (4) dry dissector; (5) scissors; (6) grooved director; (7) tissue forceps; (8) dressing forceps; (9) needle-holder; (10) Ashton's ab-

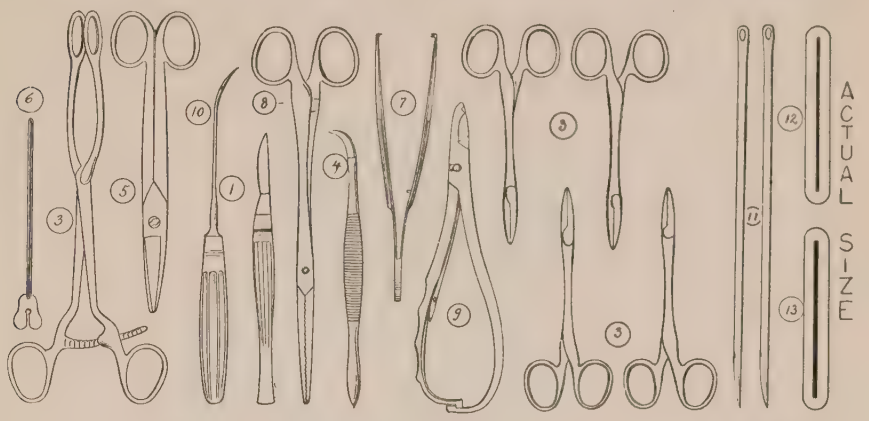


Fig. 1033.—Instruments, Needles, and Suture Materials Used in the Operation of Nephrorrhaphy.

dominal needle; (11) two straight Hagedorn needles; (12) chromicized cumol catgut, No. 3, six envelopes; (13) silkworm-gut, thirty strands.

Operation.—First Step.—A straight incision is made through the skin and fascia along the outer border of the erector spinæ from the lower edge of the

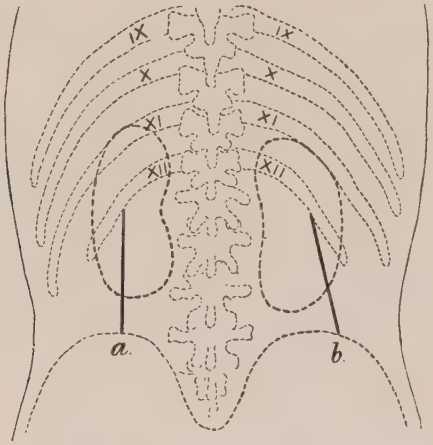


Fig. 1034.—Nephrorrhaphy—First Step.
a shows the situation of the straight incision and *b* the oblique incision.

last rib to the crest of the ilium. If the space between the rib and ilium is unusually narrow, the incision is carried a little more obliquely, so that its lower end will reach the ilium slightly to the outer side of the attachment of the erector spinæ (Fig. 1034).

Second Step.—The fibers of the latissimus dorsi are separated with the handle of a scalpel just over the outer border of the erector spinæ without opening the sheath of the latter muscle (Fig. 1035).

Third Step.—The lumbar and transversalis fascias are divided and the perirenal fatty tissue exposed. The iliohypogastric nerve, which lies beneath all the layers of the lumbar fascia and rests upon the transversalis fascia, is

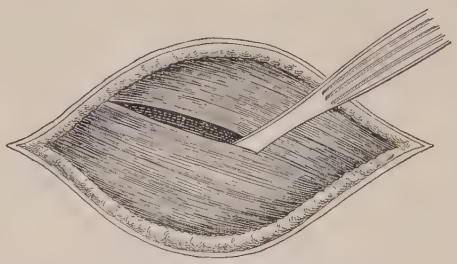


Fig. 1035.—Nephrorrhaphy—**Second Step.**
Showing the separation of the fibers of the latissimus dorsi muscle with the handle of a scalpel.

drawn to one side out of the way of injury; if this cannot be done, it should be divided and the severed ends reunited after anchoring the kidney (Fig. 1036).

Fourth Step.—The sheath of the quadratus lumborum is opened from the rib to the ilium along the anterior aspect of its lateral border. The retraction of the cut edges of the sheath exposes a large area of raw muscle.

Fifth Step.—The kidney is freed so far as necessary by blunt dissection with the fingers and an occasional clip of the scissors.

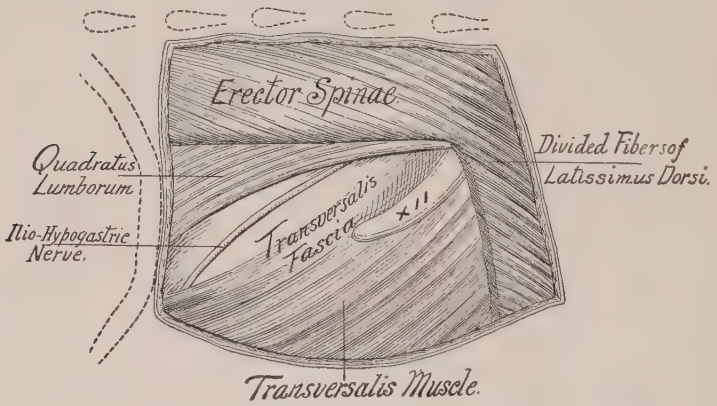


Fig. 1036.—Nephrorrhaphy—**Third Step.**
Showing the position of the iliohypogastric nerve and the relation of the anatomic structures involved by the incision.

Sixth Step.—The kidney is delivered through the wound by traction upon its fatty capsule and by rolling the patient upward and downward on the air-cushion (Fig. 1037).

The upper pole of the kidney usually emerges first and the rest of the organ follows. If the opening through the walls of the abdomen proves too small, it should be enlarged by nicking the outer fibers of the quadratus near its iliac insertion before delivering the kidney.

Seventh Step.—The whole of the fatty capsule is dissected off and cut away and the fibrous capsule exposed throughout its entire length (Fig. 1038). The kidney, its pelvis, and the upper end of the ureter are then explored, and if a calculus is found, it should be removed before proceeding with the operation.

Eighth Step.—A small nick is made through the fibrous capsule at the

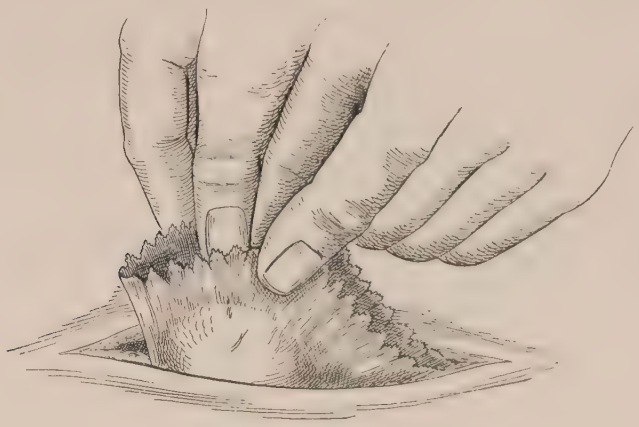


Fig. 1037.—Nephrorrhaphy—**Sixth Step.**
Shows the kidney being delivered by traction upon its fatty capsule.

middle of the convex border of the kidney and the grooved director passed beneath it (Fig. 1039). The capsule is then divided upon the director along the entire length of the convex border of the kidney to half-way around both the upper and lower poles of the organ (Fig. 1039). The capsule is now carefully separated from the kidney with the handle of the scalpel or the grooved director on both sides of the incision (Fig. 1040) and folded back over the un-

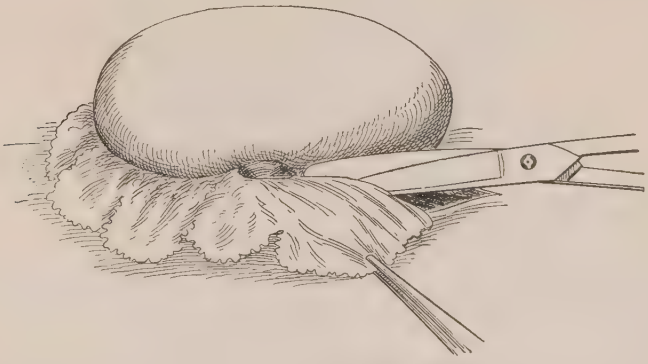


Fig. 1038.—Nephrorrhaphy—**Seventh Step.**
Showing the fatty capsule being cut away and the fibrous capsule exposed up to the pelvis of the kidney.

detached portion like the lapel of a coat so as to leave one-half of the surface of the organ denuded (Fig. 1041). The superfluous portion of the reflected capsule should be held with tissue forceps and trimmed off with scissors.

Ninth Step.—Two suspension or fixation sutures of forty-day catgut are passed on each side of the kidney through both the reflected and undetached

portion of the capsule close to their line of union. The first suture is placed at the middle of the upper and the second at the middle of the lower half of the anterior surface of the kidney, and the other set of sutures at corresponding points on the posterior face of the organ. Each suture is introduced through the reflected portion of the capsule close to the line of attachment, and is then passed immediately beneath the undetached portion parallel to the long axis of the kidney for a distance of two or three centimeters. It then emerges from

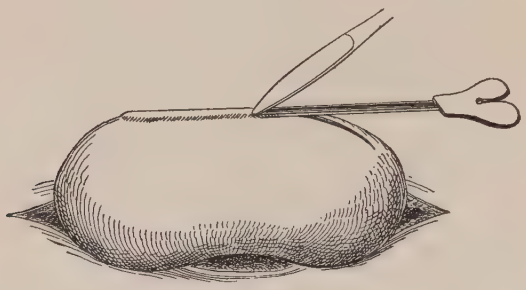


FIG. 1039.—Eighth Step.

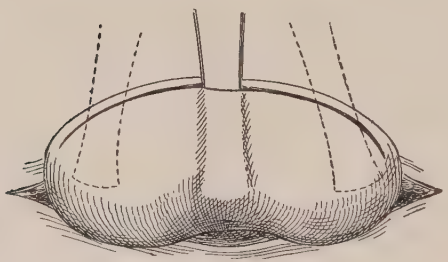


FIG. 1040.—Eighth Step.

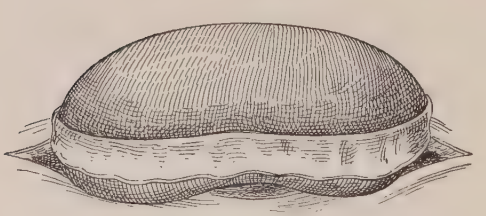


FIG. 1041.—Eighth Step. (MODIFIED FROM EDEBOHLS.)

NEPHRORRHAPHY (page 1037).

Fig. 1039 shows the capsule divided over the upper pole and the grooved director passed beneath the capsule over the lower pole while it is being divided with a scalpel; Fig. 1040 shows the separation of the capsule from the kidney with the handle of the scalpel; the dotted lines indicate extent of separation; Fig. 1041 shows the detached portion of the capsule folded back like the lapel of a coat.

beneath the capsule, and is finally passed through the reflected portion at that point. A straight Hagedorn needle should be used to introduce the sutures, and its broad surface should be placed flatwise beneath the capsule in order to prevent injuring the surface of the kidney (Fig. 1042).

TENTH STEP.—The kidney is gently pushed through the wound back into the body and the eight free ends of the fixation sutures are passed through the abdominal parietes from within outward, four to the inner and four to the outer side of the incision, each suture piercing the tissues at a distance from its fellow

of the opposite side equal to the anteroposterior thickness of the kidney. The sutures to the inner side of the incision will pierce the retracted sheath of the quadratus near its edge, the muscle itself, and the erector spinæ; the outer sutures will traverse the transversalis fascia and the latissimus dorsi. All of the sutures emerge upon the surface of the latissimus dorsi and are separated

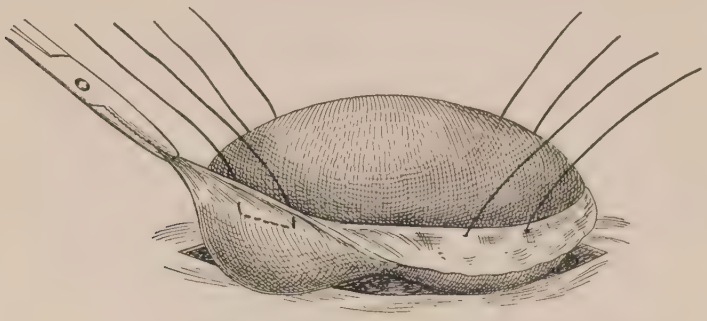


FIG. 1042.—NEPHRORRHAPHY—**Ninth Step.** (MODIFIED FROM EDEBOHLS.)
Shows the method of passing the fixation sutures.

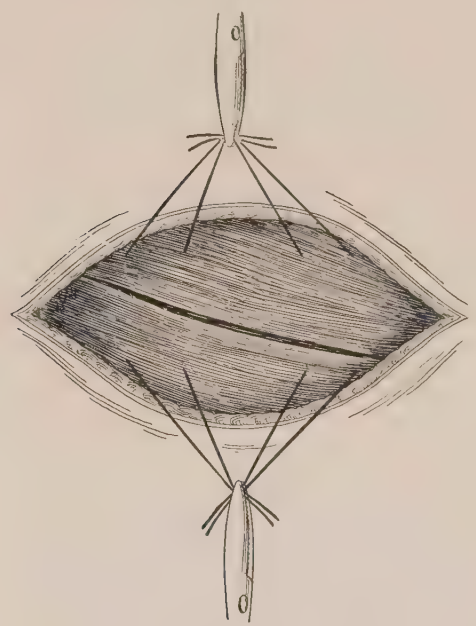


FIG. 1043.—NEPHRORRHAPHY—**Tenth Step.**
Shows the fixation sutures passing through the latissimus dorsi muscle and secured by hemostatic forceps.

from each other by distances which correspond to the point at which they are attached to the capsule; the highest suture being situated immediately below the twelfth rib.

The free ends of the sutures are secured by hemostatic forceps and are not tied until the muscles and fascia are sutured (Fig. 1043).

Eleventh Step.—The wound of the muscles and fascia is closed by from four to six interrupted sutures of forty-day catgut, which are passed in such a manner as to turn the raw surface of the quadratus toward the kidney. This

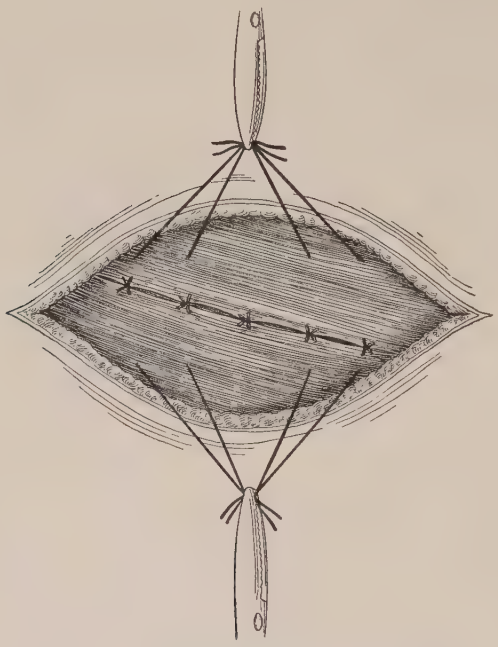


Fig. 1044.—Nephrorrhaphy—**Eleventh Step.**
Shows the wound of the muscles and fascia united and the sutures tied.

is effected by suturing the latissimus dorsi and lumbar fascia, composing the external margin of the wound, to the latissimus dorsi, the sheath of the erector spinæ, and the external margin of the incised sheath of the quadratus muscle, composing the inner margin of the wound (Fig. 1044).

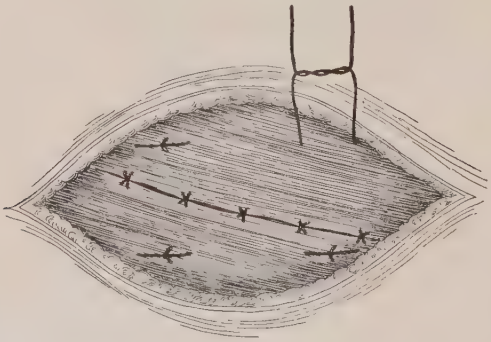


Fig. 1045.—Nephrorrhaphy.—**Twelfth Step.** (Modified from Edebohls.)
Shows three of the fixation sutures tied and the fourth being tied.

Twelfth Step.—The eight free ends of the fixation sutures are gently drawn taut in order to take up the slack and bring the denuded surface of the

kidney into close contact with the raw surface of the quadratus muscle. The two ends of each of the four suspension sutures are then tied to each other and the incision through the skin closed with the intracuticular suture (Fig. 1045).

THIRTEENTH STEP.—The dressings are applied smoothly and evenly across the entire width of the back in order that the patient's body will be equally supported on both sides of the spine.

Variations in the Technic.—If the kidney is not readily delivered, the upper pole should be seized with Ashton's kidney forceps and gently drawn through the incision (Fig. 1046).

I discard the intracuticular suture in closing the parietal wound and use a through-and-through suture which includes the skin as well as all the deeper structures and obviates the danger of leaving a dead space.

Before tying the suspension sutures and closing the incision I pass a few strands of silkworm-gut under the parietal wound sutures and bring their free ends out at the upper and lower angle of the lumbar opening. The silkworm-gut acts as a capillary drain and removes any excess of serum which may be poured out during the first forty-eight hours after operation.

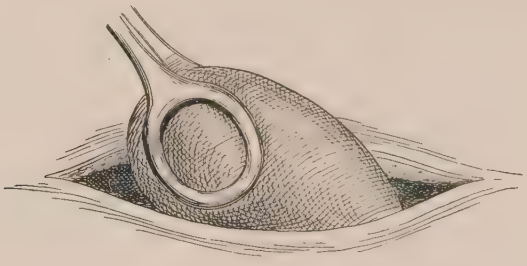


FIG. 1046.—NEPHRORRHAPHY—**Variation in Technic.**
Shows the kidney being delivered with Ashton's kidney forceps.

The parietal wound sutures are introduced with Ashton's abdominal needle.

After-treatment.—*Care of the Wound.*—The silkworm-gut drain is removed at the end of forty-eight hours and fresh dressings applied. The stitches in the lumbar wound are removed on the eighth day and the incision dressed two or three times a week while the patient remains in the hospital.

Getting Out of Bed.—The patient should remain upon her back in bed for three weeks in order to allow the adhesions between the kidney and the surrounding parts to become firm and strong. She should be kept in her room for one week longer and then allowed to go out-of-doors.

Subsequent Care.—Heavy work should be prohibited for several months or a year and the patient should avoid straining at stool.

The bowels should be kept regular and the patient's general condition improved by appropriate medical treatment.

The patient should wear an abdominal bandage (see p. 850, Fig. 777) for six months, and after that time a close-fitting corset should be worn.

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